

# Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION

AUGUST  
1942

Maintenance of equipment vital to war production involves well planned routine inspection and skillful care. See "Keeping Arc Welding Equipment in Shape", page 18.

INDUSTRIAL  
ELECTRIFICATION  
SECTION  
PAGES 49-64



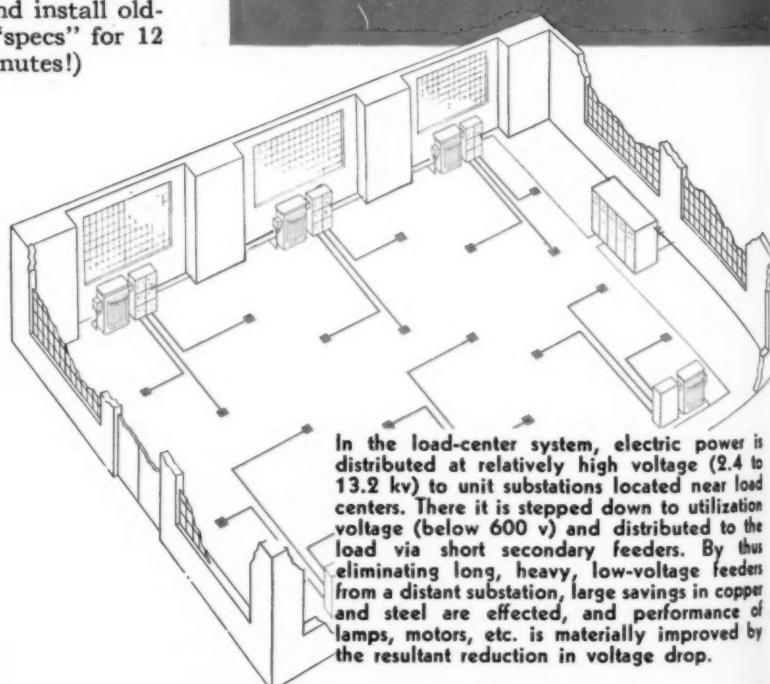
**IT TAKES  
less than an hour  
TO WRITE THE SPECIFICATIONS FOR  
STANDARD G-E UNIT SUBSTATIONS**

specified, ordered, and installed—permitting time savings of *one to six months* over the time required to design, obtain, and install old-style, "piecemeal" equipments. (In a recent case, the "specs" for 12 identical 2000-kva units were entirely written in 15 minutes!)

By specifying standard units, you avoid spending those weeks of time over the drawing board and in long, drawn-out correspondence. And standardization promotes efficient mass production to expedite deliveries still further while lowering the cost to you.

Purchasing a G-E unit substation is not much different from buying an automobile. In a recently completed plant, for example, the consulting engineer had used these compact, safety-metal-enclosed units and consequently was weeks ahead of schedule. After a sudden change in load conditions, he discovered he needed two more units to provide the necessary capacity. Referring to a G-E bulletin on his desk, he called the local G-E representative and ordered "... two more exactly like the unit in Fig. 12, page 22." That's all there was to it, and he received prompt delivery.

These completely factory-assembled unit substations consist of metal-clad primary gear, a Pyranol (noninflammable) transformer, and a low-voltage-feeder section with drawout air circuit breakers. They are designed for serving loads 600 volts and below from incoming lines up to 13.2 kv. They are quickly and easily installed near electrical load centers without expensive vault construction—and additional units can be installed WHEN and WHERE needed. Your local G-E representative will be glad to work with you on your particular application. General Electric, Schenectady, N. Y.



In the load-center system, electric power is distributed at relatively high voltage (2.4 to 13.2 kv) to unit substations located near load centers. There it is stepped down to utilization voltage (below 600 v) and distributed to the load via short secondary feeders. By thus eliminating long, heavy, low-voltage feeders from a distant substation, large savings in copper and steel are effected, and performance of lamps, motors, etc. is materially improved by the resultant reduction in voltage drop.

General Electric Co., Sect. B 302-9  
Schenectady, N. Y.

I understand your new handy guide to "Quickly Installed Electric Power Systems" (GED-1006) explains in detail the steps to follow in order to get power to new production machinery in one to six months less time.

Please send me a copy.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

**GENERAL  ELECTRIC**

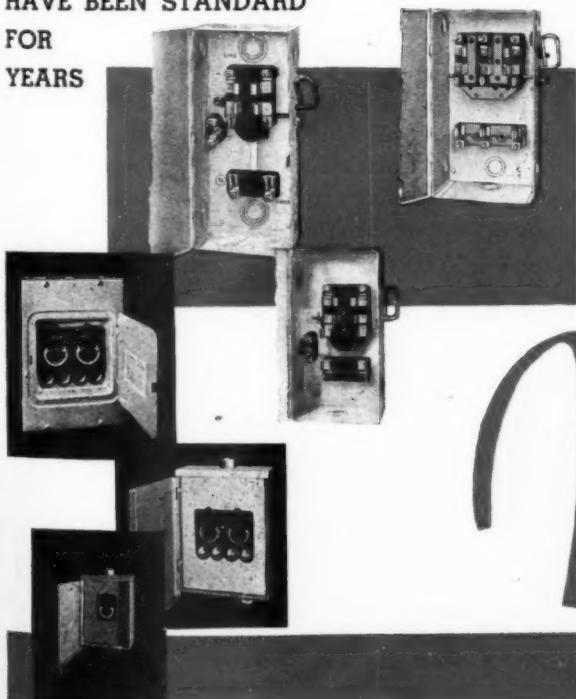
  
General Electric and its employees  
are proud of the Navy award of  
Excellence made to its Erie Works for  
the manufacture of naval ordnance.

# SOLDERLESS CONNECTORS THAT HOLD LIKE A VISE!

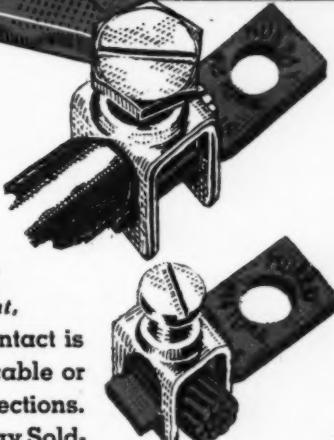


FROM YOUR JOBBER — HE HAS THEM IN CONVENIENT, ECONOMY PACKAGES!

SOME FAMED MURRAY SWITCHES IN WHICH MURRAY SOLDERLESS CONNECTORS HAVE BEEN STANDARD FOR YEARS



So strong that they'll take all the tightening you will ever give them. When they're tight, they HOLD—and electrical contact is absolute. You can insert the cable or wire from any of *three* directions. These speedily-installed Murray Solderless Connectors have been standard in Murray Switches for years. Metropolitan Device Corporation, Brooklyn, N. Y.



## SOLDERLESS CONNECTORS

*by*

# Murray

Send price sheet and complete catalog of solderless connectors.

Name \_\_\_\_\_

Address \_\_\_\_\_

METROPOLITAN DEVICE CORP.  
Brooklyn, N. Y.

ELECTRICAL CONTRACTING. Published monthly, price 25 cents a copy, Vol. 41, No. 8. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Electrical Contracting, 330 West 42nd Street, New York, N. Y. Subscription Rates —U. S. A., and Latin-American Republics, \$2.00 a year, \$3.00 for two years, \$4.00 for three years. Canada \$2.50 a year, \$4.00 for two years, \$5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries \$3.00 a year; \$6.00 for three years. Entered as second-class matter August 29, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Copyright 1942 by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.

# SOME HOMELY TRUTHS ABOUT **COLTS, NAGS** and **HORSEPOWER**



FEED THEM THE BEST HAY . . . CORN AND OATS

BUT YOU CAN'T MAKE HORSES STAY YOUNG . . . FROM COLT TO  
NAG TO GLUE FACTORY ARE SHORT QUICK STEPS . . . WITH ELECTRICAL  
HORSEPOWER, THOUGH, THE LIFE AND SERVICE A MOTOR WILL  
GIVE DEPENDS ON HOW WELL IT IS MADE . . . THE HEART OF A WESTINGHOUSE  
SMALL MOTOR IS THE ROTOR AND IT STAYS YOUNG BECAUSE IT IS MADE  
THAT WAY . . . THE ROTOR CORE IS COOLED BY A ONE-PIECE STEEL FAN . . .  
THE SHAFT BETWEEN THE BEARINGS IS OVERSIZE TO PREVENT WHIPPING . . .  
AND VIBRATION . . . THE ROTOR IS ACCURATELY GROUND TO SIZE AND  
THE COMPLETE UNIT DYNAMICALLY BALANCED . . . EVERY DETAIL IS  
DESIGNED RIGHT AND MADE RIGHT . . . WHEN YOU PICK A MOTOR  
WITH THE ON THE FRAME YOU CAN BET ON IT . . . YOU'VE PICKED  
A SURE WINNER

3-03168

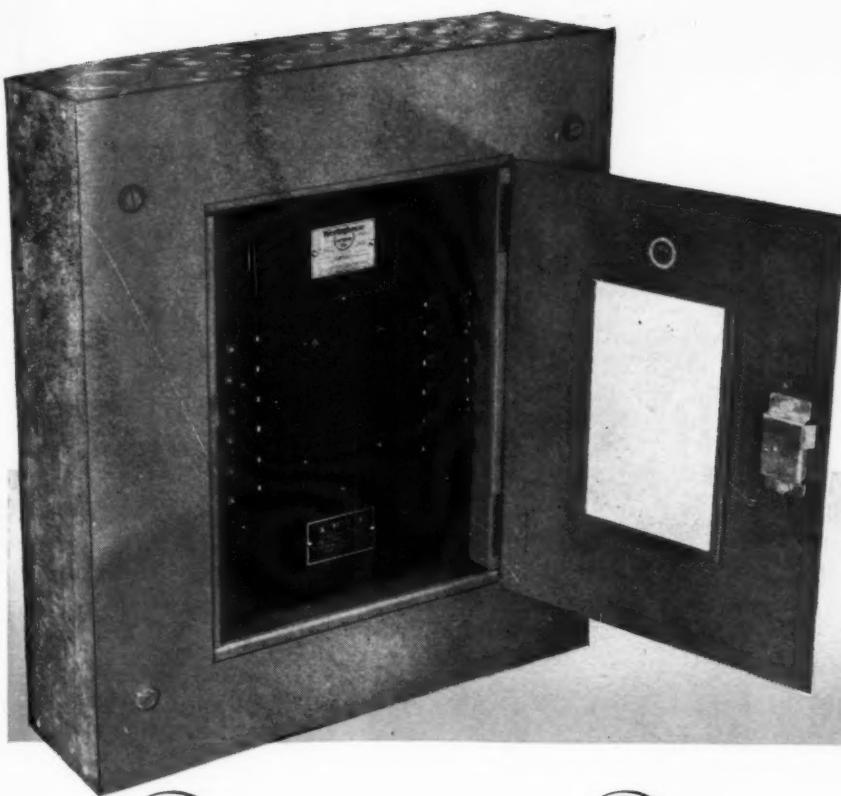


## Westinghouse

SMALL MOTORS

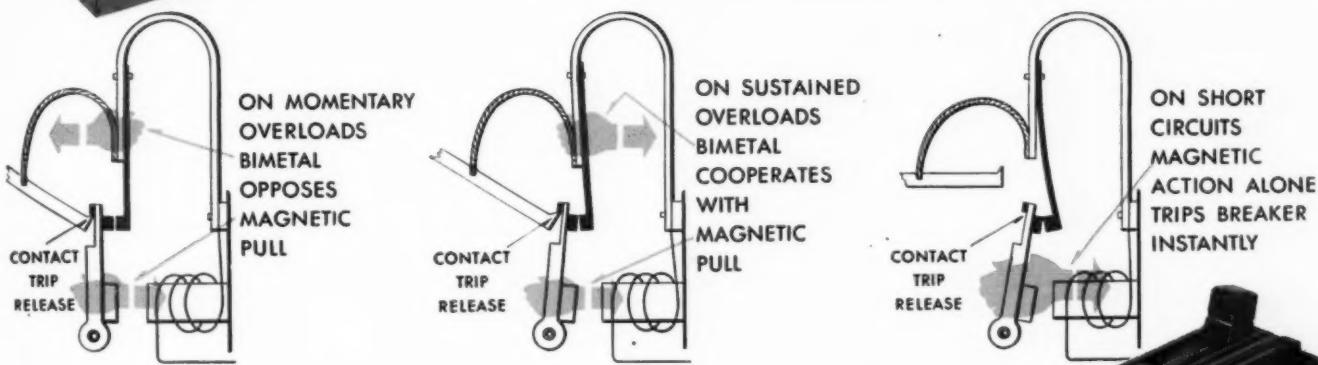


WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PENNSYLVANIA



## TYPES OF ACTION

to meet ALL THREE requirements of lighting and appliance circuit protection



Two hands are better than one—particularly when they work together.

That's the key to the improved protection of the new Westinghouse QUICKLAG Panelboard. It combines two interrupting principles to meet *all three* requirements of lighting and appliance circuit protection.

These two principles are: "magnetic"—simply an electromagnet, and "thermal"—a Bi-metal strip which acts as a spring, but bends when heated. By their co-operative action, you get maximum circuit protection with a minimum number of circuit interruptions.

**NO UNNECESSARY TRIPPING ON HARMLESS OVERLOADS.** Bi-metal does not have time to heat on short-time overloads. Spring action, therefore, opposes pull of the magnet, delays trip action on normal starting inrush currents (such as type C lamps or appliance motors).

### BURN-OUT PROTECTION ON SUSTAINED OVERLOADS.

On continued overloads, Bi-metal heats, bends, relaxing spring tension. As overload increases, pull of the magnet becomes stronger. Thus either one, or the co-operative action of both, may trip the breaker.



**INSTANTANEOUS PROTECTION ON SHORT CIRCUITS.** Short circuits energize the magnet with sufficient force to overcome Bi-metal spring tension, break the circuit instantly.

With the QUICKLAG Panelboard, Westinghouse provides the two improvements which engineers, architects, and electrical contractors recently voted as most desirable in 15 to 35 ampere breakers—*faster operation* on short circuits and *lower cost* without sacrifice of quality. Ask your Westinghouse representative for prices and a delivery date. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.  
J-60515

# Westinghouse

NOFUZE CIRCUIT PROTECTION



Thread Rolling and Header Machines, giving high-speed production with a minimum of stock waste.



Number "0" Automatic Heading Machines, making  $\frac{1}{16}$ " to  $\frac{3}{16}$ " screw blanks.



Number 1 Header with tubular rivet attachment, automatically fed, for making tubular rivets.

# H & H SCREW AND SPRING DEPARTMENTS

Imparting quality and accuracy to the "little things" that make or break Wiring Device durability

EVERY PART of an H & H Wiring Device has a carefully-engineered tie-up with the others, — and screws effect the tie-up. Screws hold together the units of all assemblies; fasten contacts and outside connections.

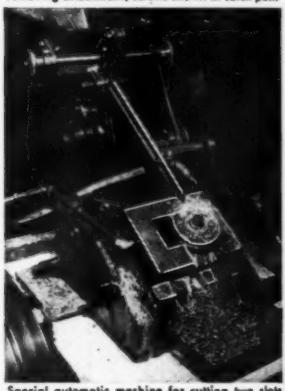
Accurately-made H & H screws contribute firmness to adjustments, solidarity to assemblies. They ensure that accurately-made parts are held in correct alignment for perfect functioning. They impart to the complete assembly the trouble-free, stay-put character of a durable product. So we make them all in our own factory.



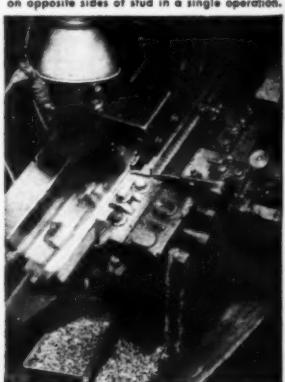
Row of Number 2 and Number 1 Heading Machines, of Waterbury-Farrell make.



Close-up of Screw Slotting Machine with bur-removing attachment; screws shown in catch pan.



Special automatic machine for cutting two slots on opposite sides of stud in a single operation.



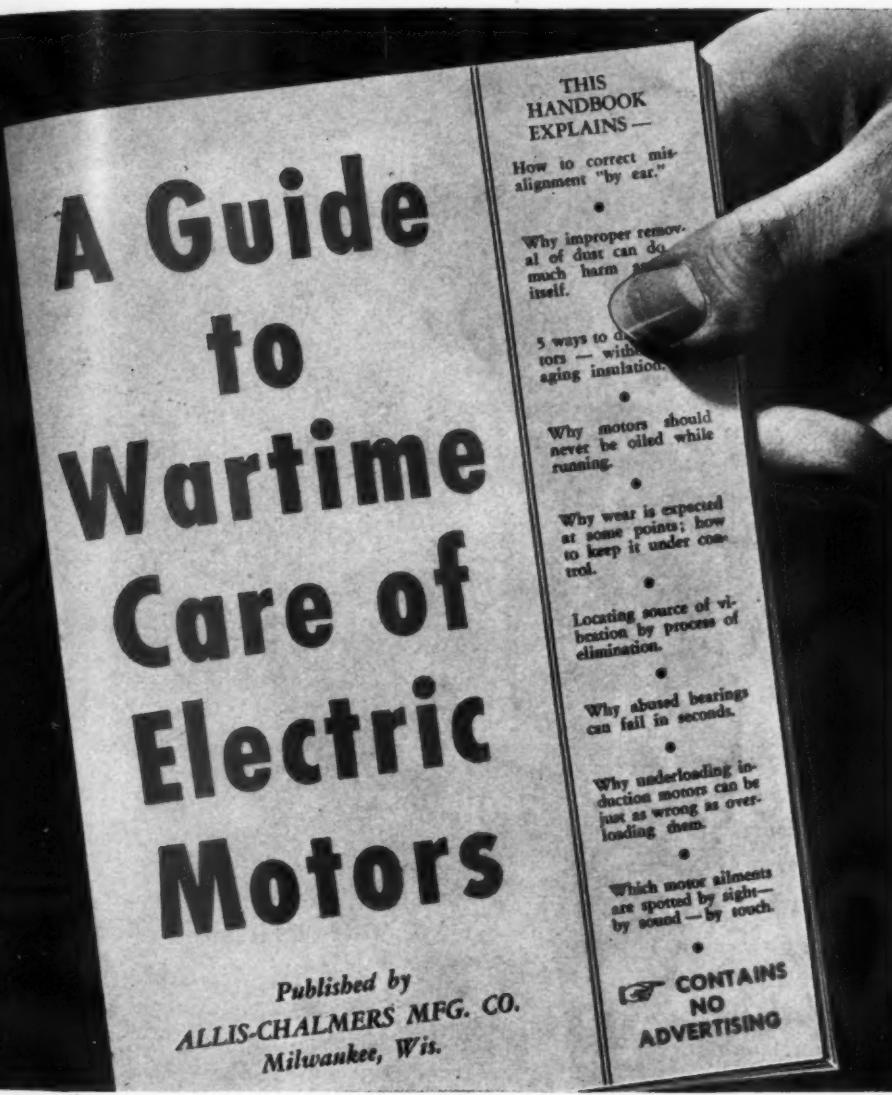
Thread Roller, automatically hopper-fed, rolling threads up to maximum of  $\frac{1}{4}$ " diameter of screw.

**HART & HEGEMAN DIVISION**  
**ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U.S.A.**



# Announcing

A VITAL NEW AID TO VICTORY PRODUCTION . . .



## Your Copy is Free!

ENGINEERS — production managers — maintenance men — executives . . . here's a valuable new handbook that you're sure to want for your technical library . . . a book designed to help you meet today's *new* motor maintenance problems!

And they *are* new problems . . .

Wartime's three-shift production has crowded *triple-duty* for motors into every day. New working days have been added!

All told, a motor's working time has skyrocketed since the emergency from 1800 hours a year to *8700 hours!*

That means that inspection, adjustment, lubrication check-ups — all must be quadrupled . . . and must be geared up to wartime standards of efficiency!

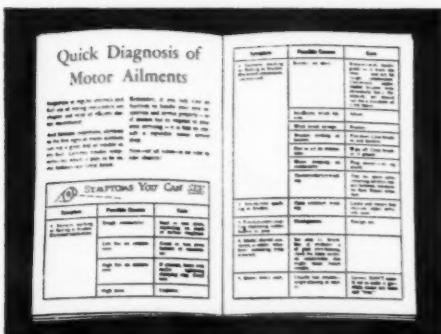
To help you most, "A Guide to Wartime Care of Electric Motors" applies to *all* makes of standard, general-purpose motors. And it takes a *fresh* look at motor care.

For Allis-Chalmers recognizes — as you do — that maintenance "as usual" went out with Pearl Harbor.

**Send for this Valuable new Handbook today**



COMPLETELY ILLUSTRATED — Making principles of motor care crystal clear. Of particular value for training new men.



HANDY REFERENCE — Helping you catch motor troubles at early stage. Tear out order form and send for *your* free copy!

**ALLIS-CHALMERS MFG. CO.**  
Milwaukee, Wisconsin

Gentlemen:

Yes, I would like to receive *free of charge* "A Guide to Wartime Care of Electric Motors".

(Name) \_\_\_\_\_

(Title) \_\_\_\_\_

(Company) \_\_\_\_\_

(Street Address) \_\_\_\_\_

(City and State) \_\_\_\_\_ A 1533-20



**ALLIS-CHALMERS**  
MILWAUKEE • WISCONSIN



# HOW TO CONSERVE COPPER IN CABLE SYSTEMS FOR WAR-JOB PLANTS

Use  
**HIGHER  
VOLTAGE**

WHEN you are planning expansion of an electric distribution system, or revamping plant wiring, there is an opportunity to save copper (compared with previous practice) by using as high voltage as you can. For example, cable at 480 volts requires only 26 per cent of the copper required for distribution at 208 volts.

Other effective conservation measures, when planning plant distribution for war production, are (1) use a high-temperature insulation because temperature limits of the insulation govern the permissible copper size; (2) use three-conductor instead of single-conductor cable wherever voltage regulation is the deciding factor, because the reactance drop in a three-conductor cable is less.

#### HOW MUCH COPPER CAN YOU SAVE?—Ask Us

In practically every case there can be a choice between two or more cables to do a job well. One, however, may permit a saving in copper—and will also conserve other vital materials.

Let us help you determine the cables that will do the job successfully and that will also conserve copper. General Electric cable engineers, both in your section of the country and at the factory, offer their services in figuring for you, or with you, just what the opportunities are.

When you save copper in the cable, you conserve copper in that part of the plant electrical distribution system where the copper requirements are the heaviest. For additional information, just ask the nearest G-E office, or write to General Electric, Schenectady, N. Y.



The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment.

**GENERAL ELECTRIC**

501-15-1200

**NOT  
THIS**

**500,000 cir mils—conductor  
size for 208 volts**

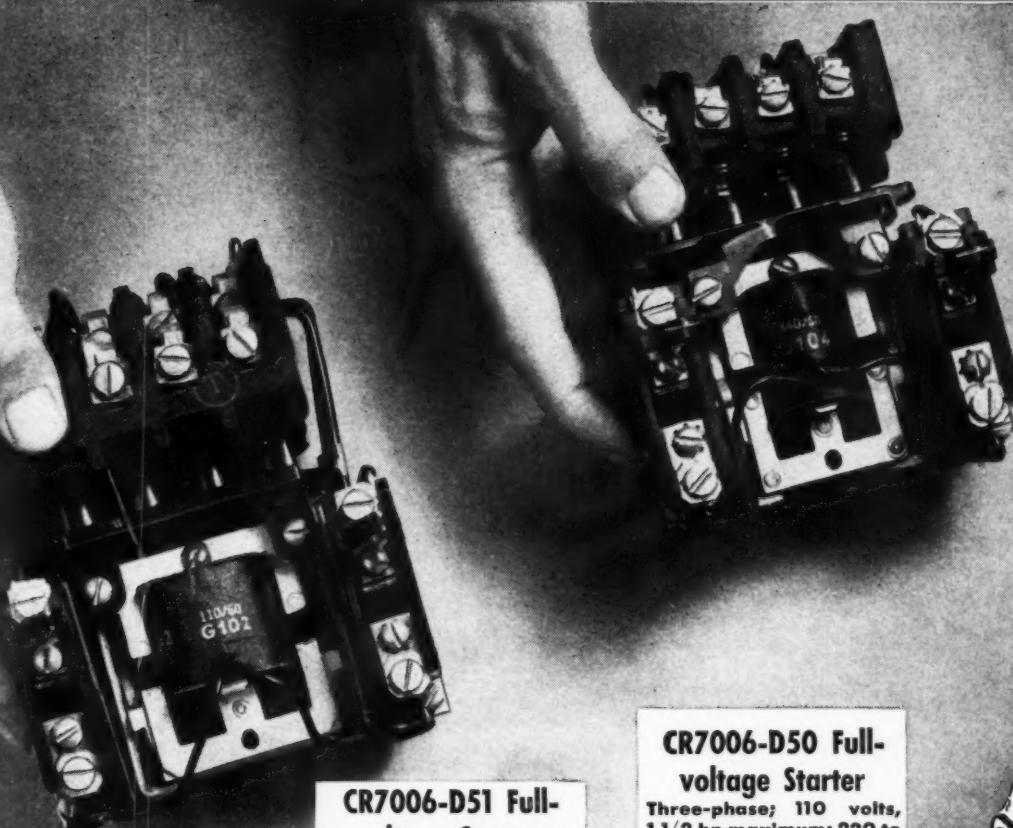
**4.6 LB COPPER PER FOOT**

**BUT  
THIS**

**2/0 Awg—conductor size for  
480 volts**

**ONLY 1.2 LB PER FOOT**

# THESE MAGNETIC STARTERS ARE AVAILABLE FOR PROMPT DELIVERY FOR WAR WORK



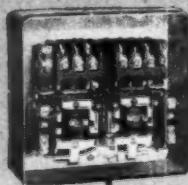
**CR7006-D51 Full-voltage Starter**

Three-phase; 110 volts, 3 hp maximum; 220 volts, 5 hp maximum; 440 to 600 volts, 7 1/2 hp maximum

**CR7006-D50 Full-voltage Starter**

Three-phase; 110 volts, 1 1/2 hp maximum; 220 to 600 volts, 2 hp maximum

## Starters for Machine Tools and General-purpose Applications



**Enclosed CR7006-D50 Starter**

Three phase; 110 volts, 1 1/2 hp maximum; 220 to 600 volts, 2 hp maximum.

**CR7009-B31JD Magnetic Reversing Starter**

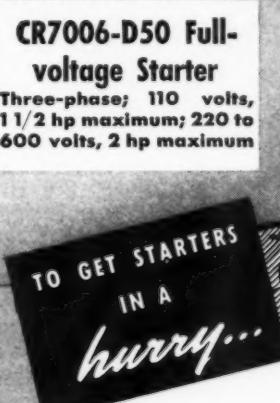
Three-phase; 110 volts, 3 hp maximum; 220 volts, 5 hp maximum; 440 to 600 volts, 7 1/2 hp maximum.

**Enclosed CR7006-D51 Starter with Push-button in Case**

Three-phase; 110 volts, 3 hp maximum; 220 volts, 5 hp maximum; 440 to 600 volts, 7 1/2 hp maximum.

**CR2943 Push-button Stations**

These accessory stations are available for either START-STOP or FORWARD-REVERSE-STOP service.



JUST pick up your phone and call the nearest G-E office. Tell us your priority rating and the type of starter you want. In most cases, we'll be able to have your starter, or starters, on the way to you before the end of the day.

Centrally located warehouses which carry an ample stock of the popular sizes and types of magnetic starters make this kind of service possible.

When you need motor control in a hurry, call your local G-E salesman. In most cases he will have just what you need in stock. *General Electric, Schenectady, N.Y.*

**GENERAL ELECTRIC**



The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment.



676-42-8490



## Joe and the 100 KVA water-cooled transformer

**W**hen Joe got out of welding school, he went to work pronto.

He got a job on the night shift of the \_\_\_\_\_ Manufacturing Company<sup>①</sup>. His work was to weld side seams and noses on 100-lb., 500-lb., and 1000-lb. aerial bombs.

One night, Joe was welding away like mad. In his mind's eye, he could see those 1000-lb. jobs falling on Tokio. Berlin, maybe.

One bomb had just let go—*wham!*—the way he'd seen them in the newsreels, when he felt someone punch his shoulder. A voice shouted, "Turn off the current, you dope, the transformer is smoking to beat the devil!"

Joe turned off the current. And they got the engineer. When the transformer was opened up, the engineer found the binder on the insulation burnt to a crisp. The friction tape on the transformer taps was also like overdone toast.

The engineer frowned at Joe. "You should have kept an eye on that waterline. She's clogged up. That's why the transformer overheated."

<sup>①</sup> Name of company on request.

Joe felt pretty bad. The maintenance crew were already repairing the waterline and the transformer was rapidly cooling down.

"Now, we'll see just how bad the damage is," said the engineer as he started taking meter readings.

Joe watched. Finally, the engineer looked up from his meter. "Go ahead, son. She works. But keep your mind on that waterline and thank your lucky stars we rewound this transformer recently with that new glass insulation."

Joe went back to welding bombs like mad.

★ ★ ★

WAR PRODUCTION poses many new problems for electrical engineers. In the case of the overload Joe caused on the transformer, the engineer in charge had already anticipated it by using Fiberglas\* as a component of the electrical insulation. Result . . . cost of rewinding transformer saved . . . 28 hours of downtime on welding operation avoided.

This is an example of preventive maintenance. There are hundreds of others.

For engineers see the wisdom of anticipating sudden and unexpected conditions. Forward-looking engineers get preventive maintenance by skillfully incorporating Fiberglas as part of the electrical insulation.

Today, wheels must turn. Longer. Harder. Faster. You can help them do this by preventing stoppages.

Perhaps preventive maintenance with Fiberglas can give you insurance against stoppages. Consult your repair man or any good engineer about this. Ask them about Fiberglas. *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ont.*

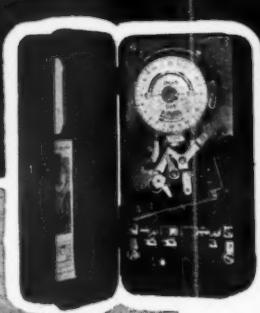
\*T. M. Reg. U. S. Pat. Off.

**OWENS-CORNING**

**FIBERGLAS\***

# *Guarantee*

PROTECTIVE DEPENDABLE OPERATION OF  
FLOODLIGHTING WITH  
AUTOMATIC CONTROL



## DURING BLACKOUTS

DURING any current interruption, as for instance when a master-switch is pulled for a temporary black-out, Form VSWZ Astronomic Dial Time-Switch will continue to run for ten hours. An automatic carry-over feature provides for clock-spring operation when the current is off. The clock-spring rewinds automatically when the current is restored, and the time-switch resumes its normal synchronous operation.

## SANGAMO TIME-SWITCHES

More important than ever before, protective floodlighting installations for factory yards, building approaches, railroad sidings, and other vital property serving in war production, need the full automatic control provided by Sangamo Time-Switches. With this control the factor of human error is eliminated and lighting is operated when, where, and as long as it is wanted. Choose from the complete Sangamo Line, which includes astronomic dial, synchronous carry-over, and outdoor time-switches.

**SANGAMO ELECTRIC COMPANY** SPRINGFIELD  
ILLINOIS

# TO THE HUNDREDS OF NEW USERS OF PYRANOL TRANSFORMERS



These 635-kva Pyranol transformers supply power to resistance welding machines in the middle of a production area.

By installing Pyranol transformers (instead of making a conventional transformer installation) you made big savings in materials and over-all installed cost.

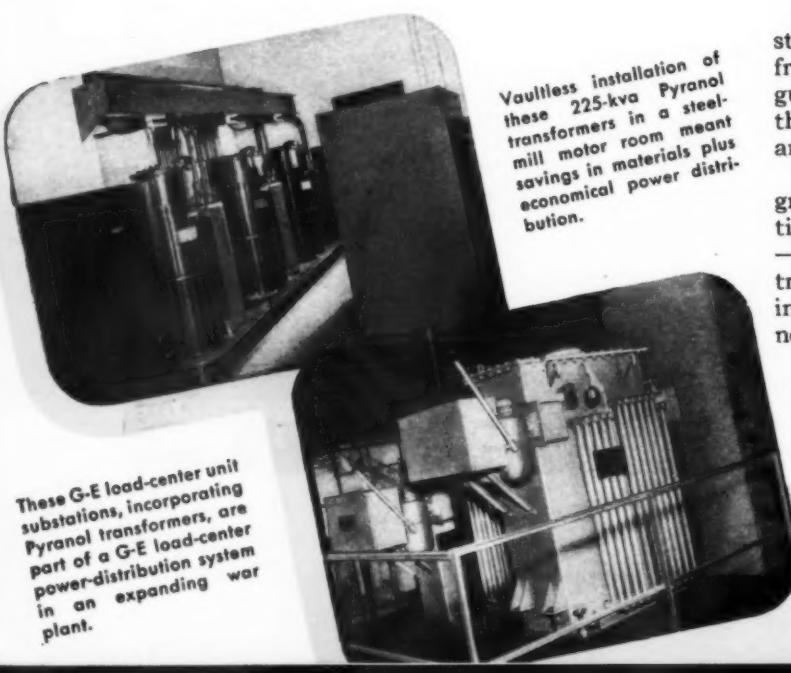
You reduced installation time and cost, because you could install these transformers indoors without a fireproof vault.

You saved copper—many tons of it if your plant is a large one—because you could install these transformers right at load centers, where transformers were meant to be installed.

You reduced line losses and voltage drop in your plant circuits and assured better performance from motors, resistance-heating equipment, lamps, and other electric equipment.

Vaultless installation of these 225-kva Pyranol transformers in a steel-mill motor room meant savings in materials plus economical power distribution.

These G-E load-center unit substations, incorporating Pyranol transformers, are part of a G-E load-center in an expanding war plant.



## Safety of Pyranol—an Asset to Your Plant

Since the introduction of Pyranol in 1932, more than 4,000,000 kva of new transformers have been furnished with this type of noninflammable insulating and cooling liquid. No Pyranol transformer, in 10 years of operating experience, has burned or contributed to a fire.

## Greater Reliability—a Continuing Benefit

The high dielectric strength of Pyranol means extra stamina to resist damage from voltage surges resulting from switching operations or lightning. This is a safeguard against progressive deterioration of the insulation that might otherwise result in a transformer breakdown and loss of power service.

Pyranol transformers have other features that mean greater reliability and little maintenance. The pressure-tight steel tank protects both liquid and solid insulation—keeps out dust, dirt, moisture, and other enemies of transformer life. Pyranol is nonoxidizing and nonsludging. It will retain its insulating properties over years of normal operation. *General Electric, Schenectady, N. Y.*



General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

**GENERAL ELECTRIC**

600-61-6310

# Electrical Contracting

With which is consolidated The Electragist and Electrical Record . . . ESTABLISHED 1901

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# BOGEY MAN!

Tops personally, he and his staff are the nemesis of all incoming materials that do not measure up to Anaconda quality standards: they check them all.

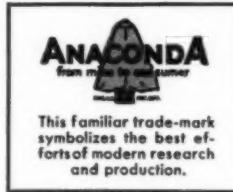
In these critical days, no one can afford to make mistakes, no matter how trifling, in so vital a product as electrical wires and cables.

Relentless guard over the quality of products going into the manufac-

ture of Anaconda wires and cables, is this "bogey man." He and his group of expert associates check every item against Anaconda's rigid specifications (tougher by far than those stipulated by government agencies), to the end that every wire and cable bearing the Anaconda name can be trusted for long, efficient, and economical service.

42244

GENERAL OFFICES: 25 Broadway, New York  
CHICAGO OFFICE: 20 North Wacker Drive  
Subsidiary of *Anaconda Copper Mining Co.*  
Sales Offices in Principal Cities



ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

**ANACONDA WIRE & CABLE COMPANY**

# Electrical Contracting

---

## WIRE OR BULLETS

Copper is the most critical of all the materials we use. There is no practical substitute for our industry. And without copper the ease or difficulty of obtaining other materials is of little consequence.

Steel, rapidly reaching the present status of copper in the preference rating required, can be materially cut by adopting different wiring methods. Synthetic insulations are relieving the rubber shortage. Other materials, though scarce, can be made available for essential wiring if the all-important copper for wire and cable is obtainable.

It would be nice if we could draw a "hopeful" picture, pointing out the possibilities of relief from the present scarcity. But whatever sign could be interpreted to show such a prospect, it can be nothing but wishful thinking. The facts all point to continued scarcity. And we shall have to consider our engineering, design and installation practices with this in mind. We can have wire for important electrical work but it must be essential to the war effort.

Why this scarcity? Why so much procedure over the insignificant amount of wire needed to run a circuit to the Jones garage or the few feet needed to replace an elevator feeder in the Main Street department store? Just this; there is a known stockpile of copper in this country; every pound is allocated to a specific use and the demand is far greater than the supply.

Cutting all non-essential uses to the bone there is still not enough to go around. If we need more for wire, it must be taken from the pile earmarked for bullets. These everyday problems before allocation specialists in WPB are complicated and numerous and they must all be answered in terms of what decision will speed our war effort the most.

There are times when a piece of wire is of much greater importance than its equivalent in anti-aircraft shells. There are other times when, in terms of the war effort, the wire that a contractor or industrial plant wants is not at all essential. Under our preference ratings, an A-1-k or better normally gives the measure of importance to the war effort that is needed to get wire. But there are a lot of jobs where wire is needed that afford no such high preference rating. Yet, because of an emergency breakdown or the vital function of the needed wiring, it becomes more important than bullets. The priorities and allocation system is prepared to handle such conditions quickly and adequately.

There are two things we can all do to help. First of all determine whether the proposed job is essential. Is it more important than bullets right now? Then, in applying for a preference rating, convey full information to the priority analysts. No matter how important the job may seem to us, analysts must have facts and figures. They, too, must be able to judge whether it shall be wire or bullets.



**T**HE job of protecting plants from sabotage and sudden danger is first of all an *electrical* job . . . something that's most quickly and efficiently handled by local electrical contractors.

Take, for example, outdoor lighting. The right searchlights and floodlights can make it virtually impossible for an intruder to enter or approach the plant without being seen by a watchman.

Well-planned installation of burglar alarms, fire alarms, sirens, bells and other emergency warning signals can go a long way toward thwarting the efforts of the internal saboteur. Together with intercommunication and paging systems, these signaling devices also form the nucleus of efficient air raid "alerts". Installation of emergency power circuits or other wiring changes to permit interruption of key operation will often be needed as well.

Any war job you may be tackling today . . . industrial conversion . . . army camps . . . air bases . . . shipyards . . . defense housing . . . can be kept moving ahead on schedule when you have the advantage of a strong *local* source of supplies. And, that's just what you have when you deal with GRAYBAR.

More than 200 leading manufacturers of the equipment frequently specified for these and other war jobs depend on GRAYBAR to speed their products to the point of need. GRAYBAR specialists are always ready to help you in planning or in meeting unusual problems on lighting, signaling or any other electrical need.

**These Graybar-distributed products are widely used on Industrial Jobs**

*Crouse-Hinds* searchlights, floodlights and other special types of outdoor lighting. Also *Benjamin* outdoor lighting equipment and *General Electric* street lighting units. *General Electric* Mazda lamps.

*Graybar* Inter-Phones, *Webster Electric* Teletalk and *Edwards* Lokator. Also, *Horni* fire alarm systems, *Federal Sirens* and other signaling and alarm equipment.

*BUStruction* Duct and other modern wiring specialties and supplies. *General Electric* Motors and motor control. Cable, conduit, wiring devices, panel boards, circuit breakers, fuses and miscellaneous supplies.

# GraybaR

**IN OVER 80 PRINCIPAL CITIES**

**Executive Offices: GRAYBAR BUILDING, NEW YORK, N. Y.**





CONVERSION to war production included modern fluorescent lighting in this weave room. New units are cord connected, rod suspended, on 9-ft. centers 10 feet above floor.

# Relighting For War Schedules

Tighter specifications on war orders, night schedules and new high speed machinery in a Southern textile plant are aided by modern lighting. A case study in plant conversion.

By W. T. Stuart

In the conversion of a Southern textile mill from normal one shift production on white cotton materials to round-the-clock production of military fabrics there is an electrical job of industry wide importance. More exacting specifications and faster machinery were hindered by a lighting system belonging to another generation. New and modern lighting was installed, new wiring was required to serve it. And the job had to be done while metals grew more scarce and priority rules tightened. In other words, this installation is typical of the conversion lighting jobs underway or planned for hundreds of plants over the country.

The relighting scheme described here is installed in a weave room built in two sections. The original room was built about 1900, 513 feet long by 102

feet wide, and an addition built about 1920, 441 feet long by 127 feet wide. This room contains 1,836 Draper looms working on cotton cloth.

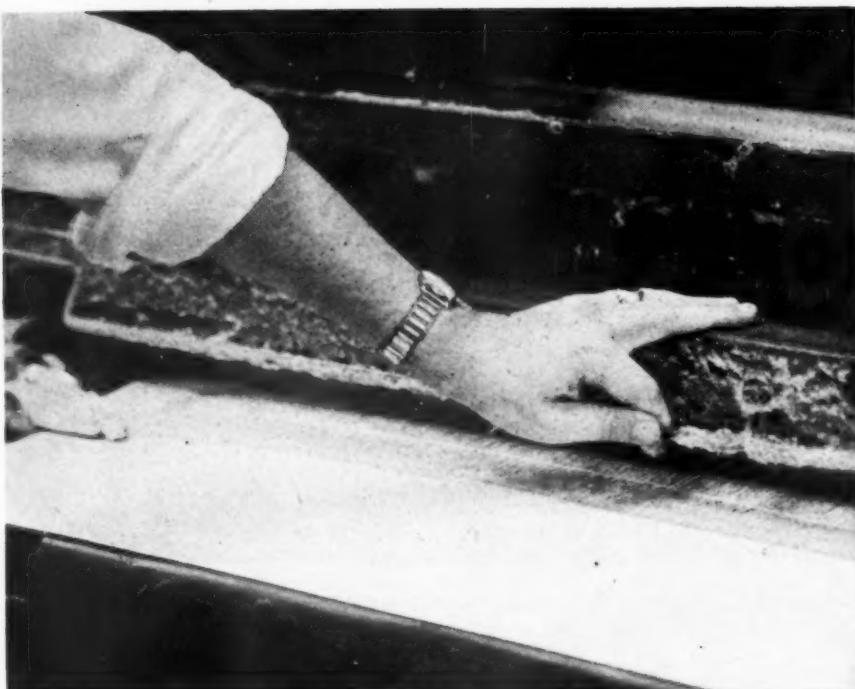
The first electric lighting job installed consisted of carbon arc lamps, later changed in the old part of the mill to incandescent fixtures with three 150-watt clear bulbs in a cluster. This fixture in outward appearance considerably resembled the arc light fixture and might have been rebuilt from the old lamps. The major portion of the new addition was lighted with RLM dome fixtures with open wiring.

In years past the mill operated on one shift and the looms operated at a slow speed on white work. The lighting was usable even if intensities on the working plane were in the neighborhood of one to two foot-candles.

Installation of the first high-speed looms in this room in the early part of 1939 prompted an investigation of the lighting and two fixture manufacturers were asked to make a survey and comment on possibilities of improving the system. At that time the main idea was to hang new fixtures in place of the old, using very wide spacings, so the old wiring system could be effectively used in its entirety.

The illumination secured by the proposed layouts was fair, but the lamp spacing was too long and the wattage high considering the final amount of light on the working plane. Fluorescent lighting for this type of plant was just coming into prominence, and since there were a few installations of sample fixtures in the plants under observation it was decided not to go ahead with incandescent lighting until all data was in on the feasibility of a fluorescent job. Also, the old wiring was none too good and the difference in material required for a fluorescent job compared to an incandescent job was felt to be enough to warrant waiting until a complete investigation could be made of the advantages of fluorescent lighting.

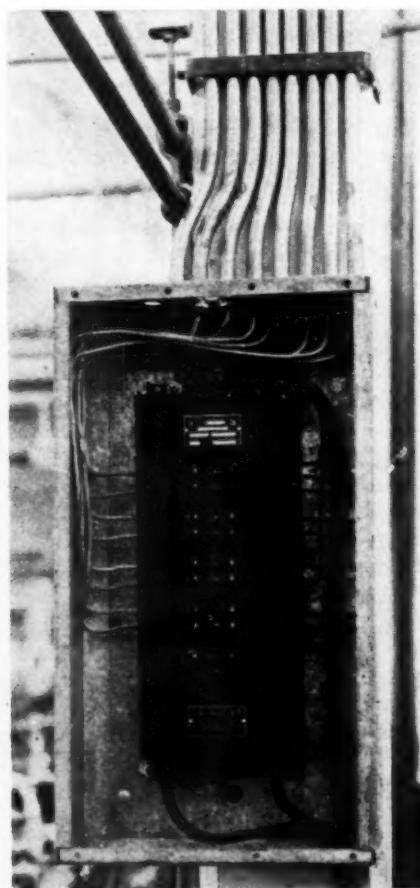
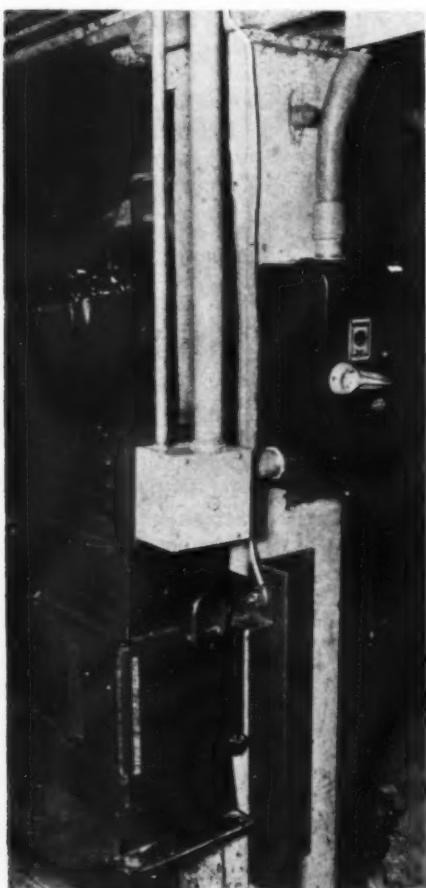
All tests were finally completed and it was decided to go ahead with a fluorescent relighting of the room, installing a conduit distribution system en-



*SHADOWLESS lighting at looms permits critical examination under high speed operating condition, improved quality, round-the-clock working schedules.*

TRANSFORMERS are air cooled, 15 kva. mounted on basement columns and protected by primary circuit breakers. Primary feeders are 440 volts, three phase.

PANELBOARDS are fed from transformers on floor below at 240/120 volts three wire. Branch circuits in conduit are No. 12 color coded and balanced.



gineered to use the minimum of pipe and wire, with panelboards for the various sections of the weave room. Power would be supplied to each of these panelboards by an air-cooled transformer at each panelboard location so voltage drops would be minimized and small voltage variation obtained at the fixtures.

Application was made to the WPB for priority rating to obtain materials on Form PD-1A. As the work performed was almost exclusively on urgently needed military fabrics for the Army, the rating request was favorably recommended by the Textiles Branch of WPB, and routed to the Building Materials Branch. There it was analyzed in the Lighting and Fixtures Section to check whether the job was economical in its use of critical materials. On further data about the lighting scheme provided by the owners the analysts recommended a rating to obtain the fixtures and wiring materials. The PD-1A form was returned to the owner with a serial number and preference rating.

For obtaining the necessary materials for both wiring and lighting fixtures the owners applied the PD-1A serial numbers obtained from the WPB to the orders issued to the contractor. The contractor in turn extended the serial number and rating to his suppliers with his purchase orders.

J. E. Sirrine & Co., of Greenville South Carolina were the engineers on the project and the Bryant Electric Co., of High Point, N. C. were the electrical contractors.

The Bryant Electric Co. furnished and installed all apparatus, material and labor for the complete relighting job. This included a main primary disconnecting safety switch, a primary feeder, circuit breakers, dry type transformers, panels, branch circuits and lighting fixtures. The fixtures consisted of porcelain enamel steel reflectors of the open end type, complete with high power factor ballasts, compensators, sockets and removable starting switches for two 48-in. 40-watt fluorescent lamps operating on 110-volt, 60 cycle current.

The plant is of slow burning mill type construction with brick walls, wood floors, timbers and columns. Monitor construction is used on the roofs. It was necessary to install the electrical work for the new lighting installation with a minimum of interference with the continuous operation of the plant.

The wiring system specified involved rigid conduit and electrical metallic tubing installed on the surface. Smaller sizes,  $\frac{1}{2}$  and  $\frac{3}{4}$ , were installed through holes bored in the beams; larger con-

duits spanned the beams with supports at intervals not exceeding 6 feet up to  $1\frac{1}{2}$  inch, and 11 feet for larger sizes.

The transformers, with their associated 600-volt air circuit breakers feeding each panelboard, were mounted in the basement of the room on the same column that supports the panelboard in the room above. These transformers were mounted in the basement to secure a lower ambient temperature, freedom from the fly lint that is an ever-present problem in a cotton weave room and operation in an atmosphere not intentionally operated at a high humidity. These transformers are also considerably more accessible for maintenance and inspection than they would be if they had been mounted in the monitors or in some other place inside the weave room proper.

Locating the transformers in the basement saved about 2,000 ft. of wire and conduit on the job, and using old 600-volt feeders wherever possible also contributed to a saving in material. Open wire 600-volt feeders were available for transformer power in part of the room, and these feeders were used.

In the final design 946 fluorescent fixtures were used in the room, each fixture containing two 48-in. 40-watt tubes. These fixtures are mounted 9-ft. apart, 10-ft. from the floor, centered over the weaver's alley, with the long axis at right angles to the weaver's alley. To save conduit, the fixtures were suspended from the ceiling by quarter inch round iron hanger rods and power brought to the unit through an attachment cord terminating in a plug fitted into a twistite receptacle mounted in an outlet box on the ceiling. This arrangement sim-

plifies taking the units down for cleaning or maintenance as they can be disconnected by the plug, lifted off the hanger irons and taken to the floor. The twistite receptacle was necessary because there is considerable vibration in this building, and some of the drops are long enough to put considerable weight on the attachment plug.

#### Job Methods

In order to execute the work as quickly as possible, the contractor's crew and men worked on the week-ends as much as possible to avoid interference from moving machinery underneath them. The first operation was laying out the work and establishing chalk lines to show locations of conduits and fixtures. Special scaffolding was built, a material storage location fixed and work benches made until the material had begun arriving on the job. Since the branch circuit wiring was practically typical, conduit for this part of the work could all be cut and bent in the shop by machines after proper measurements were taken. The moving scaffolds used for boring the overhead beams and installing the conduit were built in such a way that they spanned two of the weaving aisles with the scaffold legs in the back alleys. Weavers could therefore work through both aisles and have no interference with their job. There was quite a problem in catching the wood shavings from boring the overhead beams for the  $\frac{1}{2}$ - and  $\frac{3}{4}$ -in. conduit. This was handled by placing a cloth extension on the scaffold large enough to catch all shavings from the bits so that none

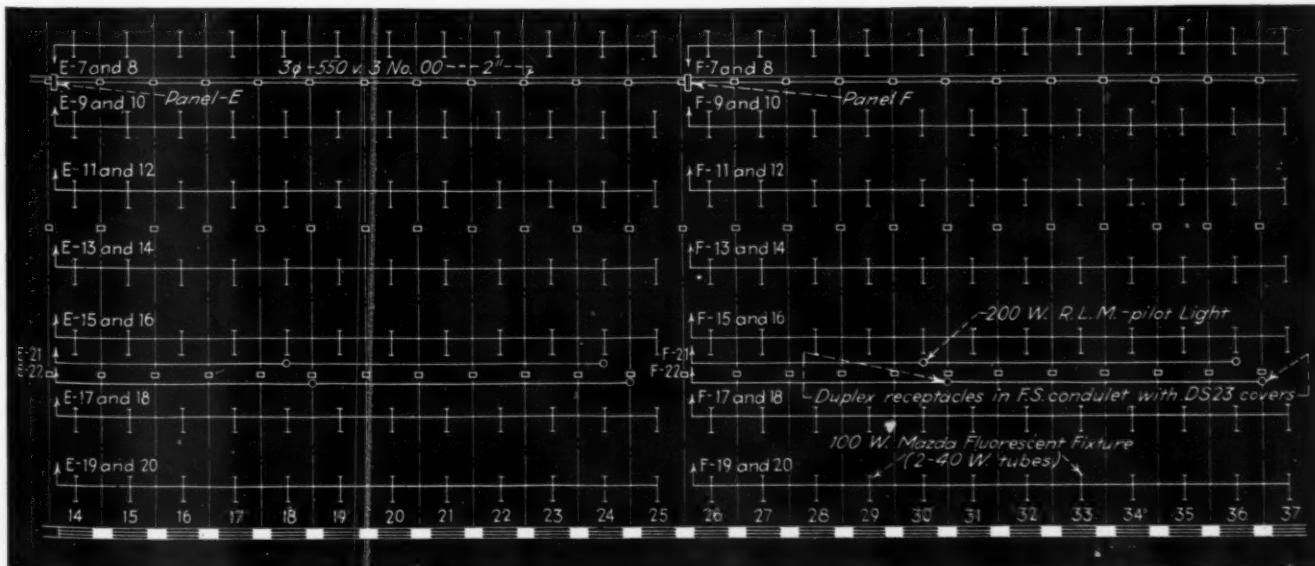
would be dropped into the warps on the looms underneath. These shavings would have caused warp breaks and loom stops. Drilling was done with  $1\frac{1}{8}$ -in. bits with a 3-ft. shank extension driven by an electric drill.

After the holes were drilled and conduit and boxes installed, wire was pulled in and wiring devices installed from the same scaffolds. Installation of feeder circuits in the basement and feeds to the panelboard involved no complications as there is little machinery in that area.

Since fixtures in various lines are identical as to wiring, length of hanger iron, and length of attachment cord, fixtures were made up complete at the work benches, carried up to the room, and installed in one operation. The lamps were installed from stepladders after the fixtures were hung.

Since almost all conduit bending and cutting, and fixtures assembly, could be done on the floor and on the work benches a nice saving of time and cost was effected.

According to the owners report, "The system in operation is giving satisfactory illumination from the standpoint of intensity and shadows. If a prime reason were to be cited as the basis for the decision to install this lighting, it would probably be based on several points—tighter specifications on finished goods, interest in seeing that the employee was given all possible tools to make as much money as he could on a piece work rate, increased quality of production, the higher illumination levels required on modern high-speed machinery and finally, you can't make it right if you can't see it."



LAYOUT plan of portion of the weave room showing the arrangement of lighting fixtures and the branch circuit routing.



BLOWING DUST carefully with low pressure air avoids driving abrasive dust into insulation of windings.

WHILE some welders are installed where conditions are ideal—where dust, dirt, and moisture are not present to an appreciable degree—most machines are located where dirt accumulates on the windings. This lowers insulation resistance and cuts down creepage distances. Steel-mill dusts are usually highly conductive, if not abrasive, and lessen creepage distances. Other dusts are highly abrasive and actually cut the insulation in being carried through by the ventilating air. Fine cast-iron dust quickly penetrates most insulating materials.

Hence the desirability of inspecting motors periodically. If conditions are extremely severe, weekly inspection and partial cleaning are desirable. Most motors require a complete overhauling and thorough cleaning about once a year.

For the weekly cleaning, the motor and generator should be blown out with dry compressed air (about 25 to 30 pounds per square inch in pressure). Where conducting and abrasive dusts are present, even lower pressure may be necessary, and suction is to be preferred, as damage can easily be caused by blowing the dust and metal chips into the insulation. On most motors the windings are fairly accessible, however, and the air can be properly directed to prevent such damage.

# KEEPING ARC WELDERS

Arc welding sets require periodic maintenance. A systematized program will pay dividends in better welder performance and longer life.

About once a year, welders should be overhauled. First, the heavy dirt and grease should be removed with a heavy, stiff brush, wooden or fiber scrapers, and cloths. Rifle-cleaning bristle brushes can be used in air ducts. Dry dust and dirt can be blown off, using dry compressed air at moderate pressure. Care must be taken to direct the air so that the dust will not cause damage and will not be pocketed in the various corners. Grease, oil, and sticky dirt are easily removed by applying cleaning liquids such as carbon tetrachloride.

If the welder can be spared from service long enough, the insulation of the motor should be dried out by heating to from 90 to 100 C. While the motor is still warm, a high-grade insulation varnish should be applied.

The varnish may be sprayed or brushed on. After applying the varnish the best results are obtained by baking for six to seven hours at about 100 C. If the machine must be put back into service quickly, or if facilities are not available for baking, fairly good results will be obtained by applying one of the varnishes which dry in a few hours at ordinary room temperatures.

## Lubrication

Manufacturers' instructions regarding lubrication of bearings should be carefully noted. These instructions should be kept near the welder so that they are readily accessible. Usually grease-packed bearings have sufficient lubricant when shipped from the factory to last about a year under normal conditions of cleanliness and temperature. When sets are operated in unusually dirty atmospheres, run continuously 24 hours per day, or exposed to extremes of temperature, it would be well to shorten the bearing inspection and lubrication interval down to six months, or less if experience warrants. An occasional check of bearing temperature by feeling with the hand may disclose undue heating before damage is actually done. Once a lubricating routine has been es-

tablished, it should be carried out, and by men who will follow instructions.

The first essential requirement for the satisfactory operation of brushes is the free movement of the brushes in their holders. Uniform brush pressure also is necessary to assure equal current distribution. Adjustment of brush holders should be set so that the face of the holder is approximately  $\frac{1}{8}$ -inch up from the commutator; any distance greater than  $\frac{1}{8}$ -inch may cause brushes to wedge, resulting in chattering and sparking.

It is essential that the correct grade of brush for a specific application be used. Recommendations as to the correct grade of brush should be obtained from the manufacturer of the welder.

Broken brushes imply incorrect brush grade, or mechanical defects (such as unbalanced, rough or eccentric commutator). To eliminate brush breakage, both factors should be corrected.

Check the brushes to make sure that they will not wear down too far before the next inspection. Keep extra sets of brushes available so that replacement can be made when needed. It is false economy to use brushes down to the absolute minimum length before replacement. Cases have been known where brushes have worn down until the metal, where the pigtails connects to the brush, was touching the commutator. This, of course, was causing damage.

Make sure that each brush surface, in contact with the commutator, has the polished finish that indicates good contact, and that the polish covers all of the surface of the brush. When replacing a brush be sure to put it in the same brush holder and in its original position. It has been found helpful to scratch a mark on one side when removing it, so that it will be replaced properly.

When installing new brushes, fit them carefully to the commutator. Sand only until the curve of the brushes is the same as that of the commutator. Be sure that the brush shunts (pigtails) are fastened securely so that current will not overheat the brushes and brush holders.

# WELDING

By R. F. WYER.

Welding Engineer  
General Electric Company



SANDING BRUSHES to a good fit with the commutator is essential when new brushes are installed.

INSULATION RESISTANCE should be regularly checked with an accurate instrument to detect leakage.

commutator bars slightly. If the commutator is found to be dirty when the generator is inspected, it should be wiped clean with a piece of canvas or other cloth that is free from lint.

## Transformers

On fan-cooled units, fans should be cleaned and lubricated about once a year. Windings should be blown out at least twice a year in very clean locations, and more often in dusty places. At the time of this periodic attention, all connections and coil supports should be checked for tightness. Manual current-adjusting mechanisms should be lubricated often enough to prevent stiff operation of the handwheel or crank, making sure that a fairly high melting-point grease is uniformly distributed over the full length of screws and guides. On motor-operated controls, lubrication at more frequent intervals may be required, as evidenced by slowing down of the motor or noise from the gearing. This point should be checked at least three times a year, and more often if experience justifies it.

## Abuses

While most welding equipment is designed to stand up under unusually adverse operating conditions, some circumstances will cause serious impairment if not complete interruptions of service.

One bad practice, for example, is that of leaving weather-protecting tarpaulins thrown over machines in operation, in such a way to interfere with the free passage of ventilating air into and out of the equipment. Cases are known

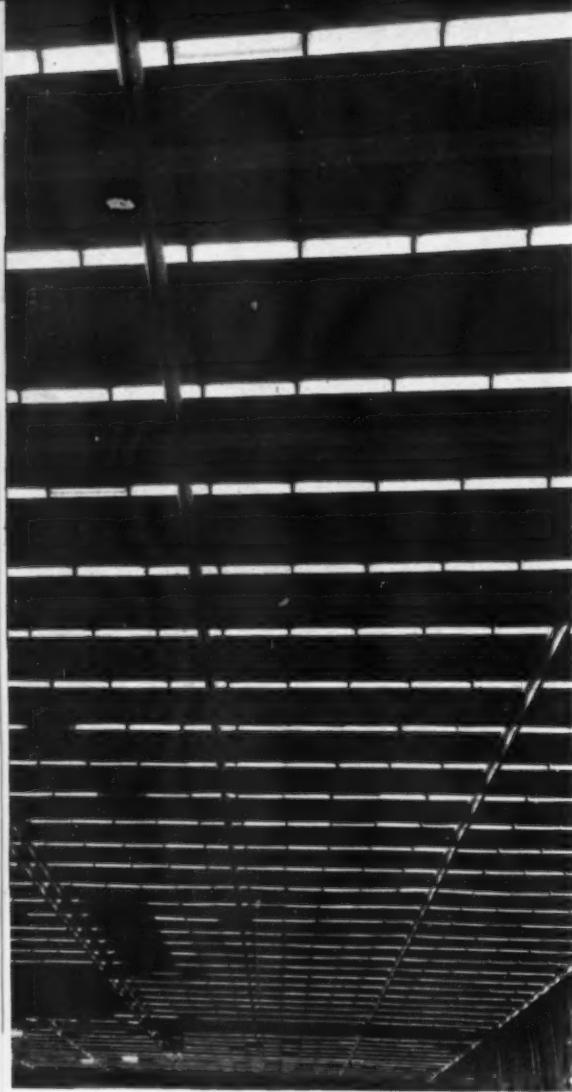
where welders have been equipped with canvas flaps permanently installed on inlet and exhaust air openings, resulting in overheating and short equipment life.

Improper connection of extension leads for either the electrode or work terminals is not at all uncommon. This results in a high resistance circuit from welder to arc and return with resulting variations in welding current, particularly when the leads are moved so as to change the resistance of the connections. This is a frequent cause of complaints by welding operators that the heat is not steady. The remedy for this is to make sure that connections are tight, and that all connections are made with cables equipped with properly installed cable lugs or terminals. It is practically impossible to bolt or wedge untinned flexible cable to another conductor and secure a good low-resistance joint. Soldered or reliable solderless terminals should always be used.

The use of excessively long electrode or work leads with motor-generator type welders will result in overheating of the motor when operating in the upper part of the current range unless extraordinarily large cables, or a number connected in parallel, are used. Overheating of the motor from this cause is a frequent reason for motor-generator welders tripping off the line with consequent loss of production.

A source of trouble which is not protected against by the motor overload relays is the intentional or unintentional application of long continued short circuits on the generator. Poor cable or

[Continued on page 65]



ENDLESS ROWS of fluorescent units, mounted end-to-end, project a blanket of cool light on the bombers being assembled below. These units, at a 36-ft. mounting height, provide 30 foot-candles on the working plane.

**G**OOD light for production might, is a slogan often heard and a principle recently applied to the new mass production Ford Willow Run Bomber plant. The plant, designed by Albert Kahn Associated Architects and Engineers, Inc., Detroit and constructed by the Bryant & Dewiler Company of Detroit, is lighted entirely by fluorescent units.

The lighting system, installed by the John Miller Electric Company of Detroit, is of the network type and is interconnected on the primary sides of the transformers by master substation 13.8 kv. bus sections common to both the power and lighting systems. These emergency primary connections are shown in the accompanying Fig. 1, and are described in the article "Power for Bomber Production" which appeared on page 17 of the July issue of *Electrical Contracting*.

# LIGHTING . . . For Bomber Production

Four-motored bombers are born under a 35 foot-candle blanket of cool fluorescent light in Ford's new mass-production plane plant. A network system with primary and secondary transformer interconnections provides lighting reliability at all times.

By August Eckel

Underground feeders of 3-conductor No. 2/0 cables run from the master substation high voltage bus sections to a series of underground substations that serve the manufacturing area of the plant. Here the feeders terminate at a three-phase 13.8 kv./120/208-volt lighting transformer complete with network protectors and secondary cubicles. Each feeder serves two transformer units.

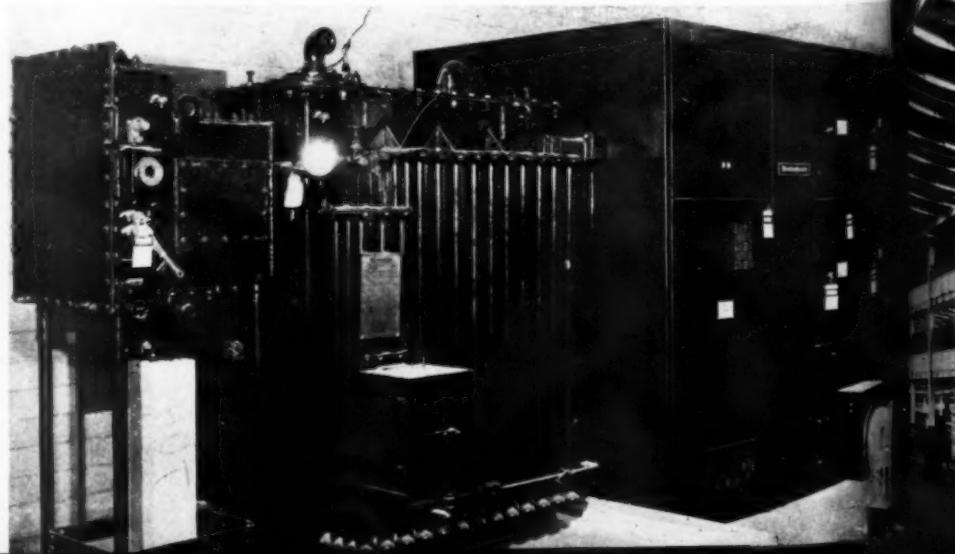
The low voltage network consists of interconnections between the secondary buses of all lighting transformers primarily fed by the same incoming utility high line. Each secondary 120/208 volt three-phase plant substation bus is connected to the buses of two other substation transformers fed by different 13.8 kv. feeders. As illustrated in the one line diagram of Fig. 1, the secondaries of alternate substations are thus tied together. Low voltage interconnection be-

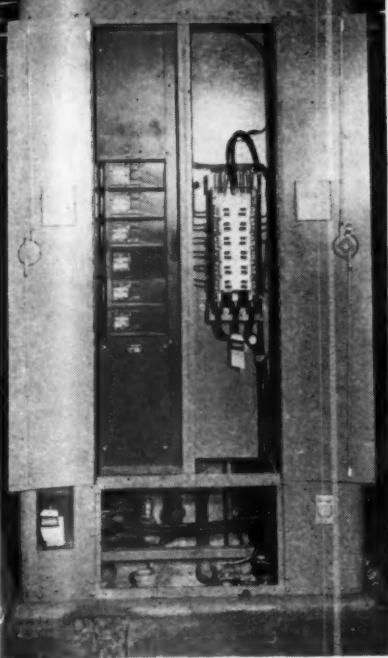
tween the two incoming services, on the lighting end, is made through two lighting transformers, one fed from main bus section No. 1, the other on main bus section No. 4. If any one substation lighting transformer is put out of service, the lighting buses can be fed from one or both of its interconnected units.

## Branch Circuits

Three-phase four wire feeders go from the plant substation buses to master panels in column cubicles which, in turn feed the lighting distribution panels mounted in sections of the same cubicle or separate cubicles on other columns. In general these master cubicles are on a mezzanine or second floor and feed up or down to serve the general high bay; second floor or under-mezzanine lighting circuits. Lighting branches are the only

LIGHTING TRANSFORMER with network protector and secondary switchgear is typical of those in all plant underground substations. This one is rated at 750 kva., 13.8 kv./120/208 volt, three-phase, 4-wire.





COLUMN CUBICLE, typical of those throughout the entire plant, houses the lighting branch circuit panel. Other panels are for power and high cycle circuits.

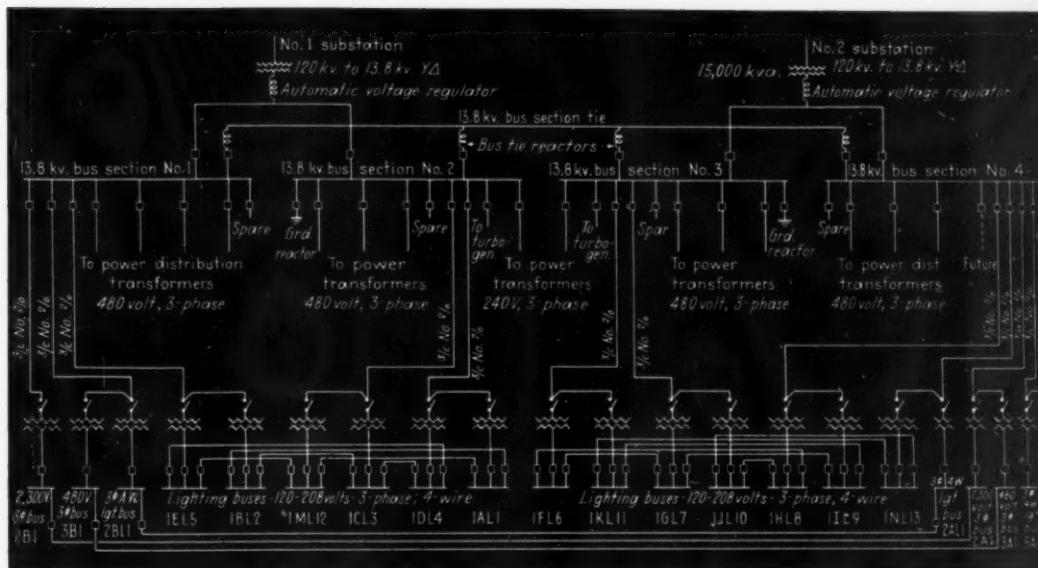


FIG. 1 SECONDARY NETWORK on the lighting system provides a means of energizing all lighting buses during an emergency. Alternate substations are interconnected. Primary interconnections are made through the 13.8 kv. bus sections and bus tie at the master substation.

circuits in the entire plant that leave the distribution cubicles at the top.

More than 76,000 two-lamp, four-foot, open end, RLM industrial fluorescent units are installed to provide a maintained intensity of 30 foot-candles on the working plane. In the general assembly area, the units are mounted end-to-end at a 36-ft. mounting height, in continuous rows on approximately 10-ft. centers. Under mezzanines and low bay areas, continuous rows are unnecessary and the units follow conventional spacings.

Messenger cable was used extensively for mounting the units in the high bay areas and in locations where structural steel work occurred. The branch circuit conduit was fastened direct to the messenger cable and the fluorescent units chain suspended so the bottom of the reflectors were flush with the bottom of the

steel trusses. Conduit "T" fittings in the branch circuit serve every two fixtures with two lengths of reinforced extension cord terminating in a receptacle plug on the top of each unit. This arrangement facilitates easy maintenance and replacement, since the unit need only be unhooked from the chain suspensions and the canopy plug disconnected. A spare unit can be quickly and easily installed.

#### Flexible Control

Flexibility of light control is accomplished by the fixture circuiting and consequent switching. In some sections of the plant the units are alternately circuited, so that flipping one switch will turn on every other unit in the row. In other sections, every third fixture is connected to the switching circuit. In this manner, depending upon the type

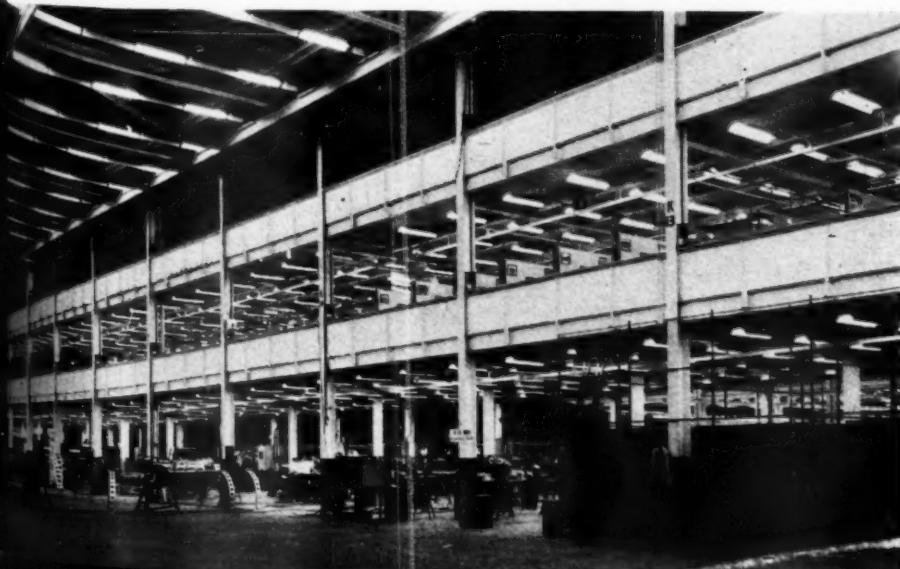
of work being done, the light intensity can be either one half, one third or full foot-candle intensity.

Of interest also, was the actual method of installing the miles of lighting conduit throughout the plant. Specialized crews were used, each doing its particular job day in and day out, moving from one end of the plant to the other. Wherever possible, the branch circuit conduits were pre-assembled and wired on the ground, complete with the drop cord extensions and necessary fixture plugs. Where the runs were exceptionally long, the conduit was made up and wired in sections, with connections made in the conduit fitting as the sections were joined at the point of installation.

Mass production methods were also applied to the small but important "incidental" work. One specialized crew worked at a bench, cut suspension chains to the proper length and inserted the necessary hooks; another crew cut the drop cord extensions and skinned both ends; still another kept busy at cutting conduit; another at assembling; one at wiring the sections; and so on. All worked together to a common goal—the completion of the plant in record time.

And so, as the construction crews neared the end of their job—with a finished plant behind them, the production crews followed in their dust starting raw materials on their way to finished planes. And, the electrical system went to work furnishing ample power and the best of lighting to help attain the production goal—one four-motored bomber per hour.

MEZZANINE LIGHTING is fluorescent also. Units here are suspended from the low bay ceilings and follow conventional spacings. Lighting panels are in cubicles mounted back to back on the steel columns, taking up as little space as possible.



# Interlocking A.C. Linestarters

**S**TANDARD a.c. linestarters fulfill most of the requirements necessary for controlling a single motor application. However, when the operation of two or more motors on a machine must be coordinated, electrical interlocking is essential for providing safety of operation, protection of the equipment, and insuring the correct sequence of operations. A motor controller may be specially designed to insure almost any sequence of control operations desired; however, such a controller is more expensive and requires more time to procure than a standard linestarter.

Interlocking is usually necessary between motors on machine tools, conveyors, movable bridges, cranes, multi-motored tandem wire drawing machines, etc. Any electrical interconnection between a group of motor controllers to coordinate the operation of one or more motors with respect to others in the group is called "electrical interlocking." By the addition of an extra inter-

## Circuit Connections For Operating Two or More Motors With Conventional Controls.

By R. B. IMMEL

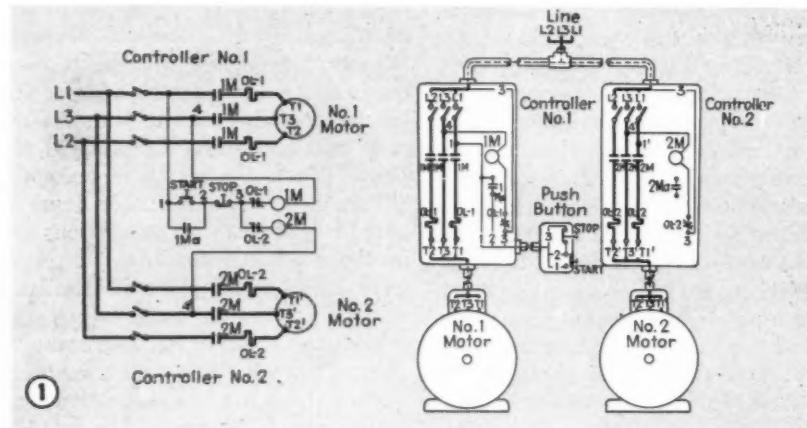
Control Engineer, Westinghouse Electric & Manufacturing Co.

lock or auxiliary contact on the starter and a slight revision of or addition to the wiring, it is often possible to secure the sequence or coordination desired with standard linestarters.

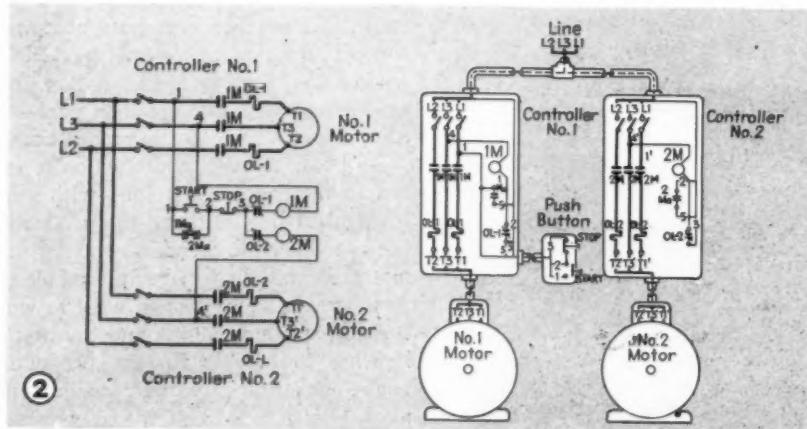
At this particular period of time when special controllers are difficult to obtain and the beginning of production is very essential, standard and often times stock controllers should be seriously considered. It may not be possible with standard starters to obtain all the interlocking and control features desired, but it is quite likely that the most essential and necessary control functions

may be obtained so that the installation may be completed and production of essential goods started.

The wiring schemes discussed here are but a few of the possible interlocking and coordination systems that are possible with ordinary standard and stock linestarters and pushbutton stations. It should be noted that all the examples on interlocking of controllers shown used the same basic controller except for the addition of an interlock when necessary and for a revision in the wiring. Most linestarters are constructed so that one or two extra interlocks may be easily installed.



**FIG. 1** Some machines or processes require that certain motors operate at all times and that the control equipment prevent operation of other motors on the machine unless this condition is fulfilled. Two standard linestarters may be interconnected as shown so that two motors may be started simultaneously from one pushbutton station. An overload on motor No. 2 will stop that motor only and will permit the operation of the No. 1 motor. However, an overload on the essential motor No. 1 will stop both motors. Operation of the stop button will stop both motors at the same time.



**FIG. 2** This wiring scheme is for starting two motors simultaneously, but is different from the first scheme in that both motors must operate at all times. An overload on either motor or operation of the stop button will stop both motors at almost the same time.

More than two motors may be wired to obtain this same control operation if the holding interlocks are all connected in series and the coils wired in parallel. Careful observance of line polarities will often simplify the external wiring.

**FIG. 3** As pointed out for Fig. 1, some applications require that an essential motor operate at all times and prevent the operation of other motors unless it is running. With this particular scheme each motor and controller has its own pushbutton station. The No. 2 motor, controller, and pushbutton are inoperative unless the No. 1 motor is operating. An interlock on the first controller will prevent starting or operation of the second motor unless it is closed. The operation of this second motor is optional and possible only when No. 1 motor is in operation.

★ ★ ★

**FIG. 4** There are some applications that require the various driving motors to be operated in a definite sequence. This wiring scheme prevents No. 2 motor from running before the No. 1 motor and allows it to run only as long as the No. 1 motor is in operation. It should be noted that this scheme differs from Fig. 1 and Fig. 2 in that the 1M contactor must close before the 2M contactor may be energized. This sequence in operations and slight time delay between contactor closings may fulfill some particular requirements.

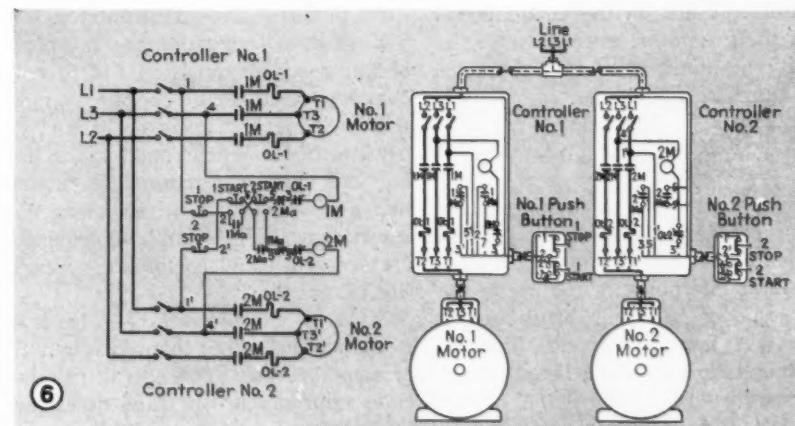
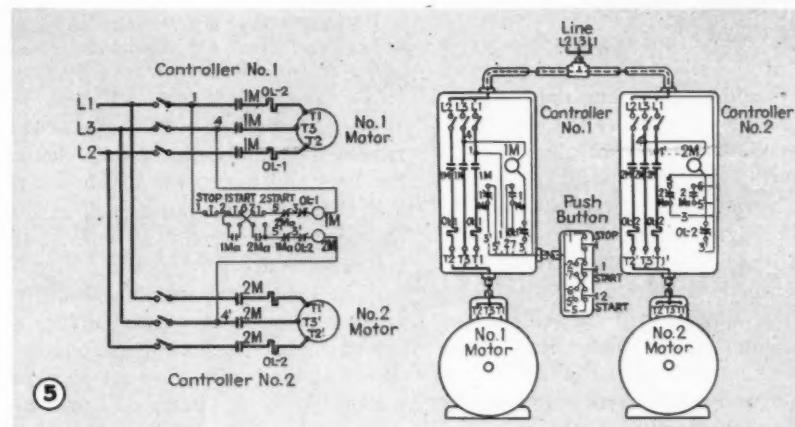
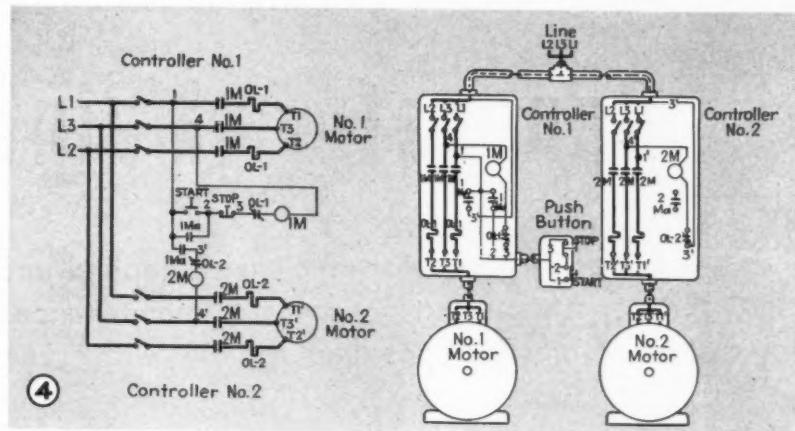
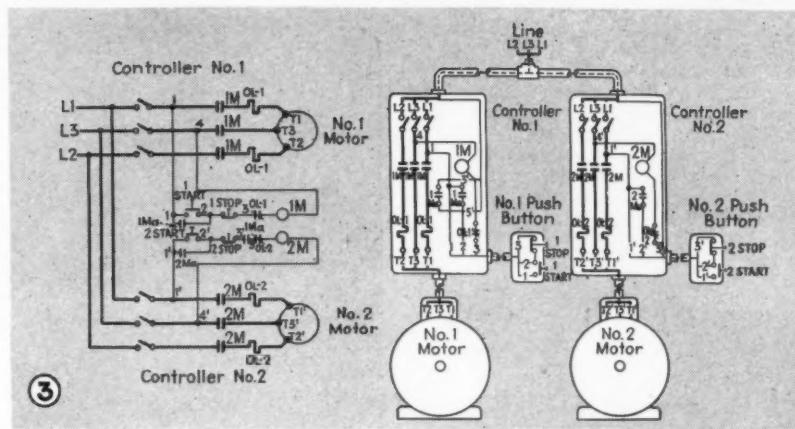
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**FIG. 5** Two driving motors may be required for the operation of some machines, but the machine may also be arranged so that only one drive or motor may be operated at one time. With this scheme, if both start buttons are pushed down at the same time, neither motor may be started as the energizing circuits are completely disconnected.

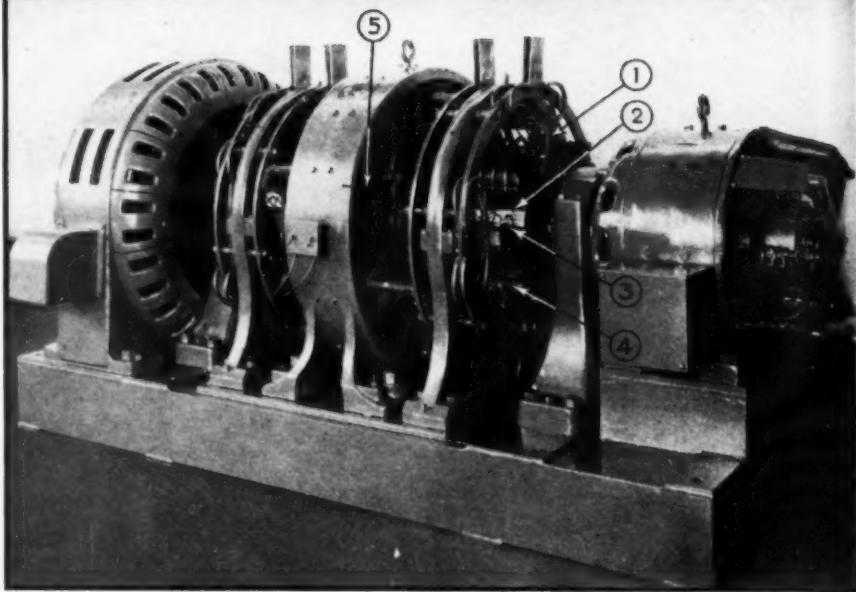
If one of the motors is operating, it may be stopped and the other one started by merely operating the start button pertaining to the motor that is not running. Operation of a start button will break the holding circuit for the other contactor coil. A break interlock contact of one controller in the holding circuit of the other controller will prevent more than one contactor from being closed at the same time. Either motor may be stopped from a single stop button.

★ ★ ★

**FIG. 6** It is sometimes more convenient to have more than one pushbutton station to control a machine. This wiring scheme is similar to the previous one except for the addition of another pushbutton station.



SALIENT TROUBLE POINTS on plating generators include (1) brush-holder rigging; (2) commutator; (3) brushes; (4) brush-holders; (5) interpoles and airgaps. Standard maintenance of the driving motor, exciter, and auxiliary control equipment is also vitally important to efficient trouble-free operation.



# PLATING

## Generator Maintenance

Plating generator efficiencies depend upon proper design, operation and commutator maintenance. Here are a few sources of possible trouble with suggested remedies.

PLATING generators, or low voltage generators, are more in demand now than ever in the past—primarily because of their many new uses in present day industry. Among these applications are nickel, copper, and silver plating; anodic treatment of aluminum for the aircraft industry; also low voltage direct current generators for degaussing units on board ships.

The more modern low voltage generators are designed for slightly higher operating speeds than the older ones, thus gaining higher efficiencies and better operating characteristics. But, commutator peripheral speeds, in general, have not been increased, the commutators being slightly smaller in diameter and wider. Here, in the commutation end of the generator, is the seat of the majority of plating generator troubles and maintenance problems.

### Commutation Troubles

Commutation troubles can be caused by improper design of commutator and brush holder rigging, improper construction of interpoles, or the use of the wrong type of brush or brush holder rigging. A few maintenance hints in the commutation field are listed below.

1. *Diagnosing Trouble*—One of the first steps in determining commutation

By F. L. Hanson

Vice-President and Director of Sales  
The Ideal Electric & Manufacturing Co.  
Mansfield, Ohio

trouble is to take the voltage between the heel and toe of the brushes with a low reading voltmeter. Such readings should never exceed 0.25 volts. With voltage contact feelers, the two points may be kept apart the thickness of the brush on the commutator surface and moved slightly in both directions to assure that the brushes are set on neutral voltage position. Pairs of brush arms should be staggered one-half brush width so that both polarities run in each path for even commutator wear.

2. *Wiping Commutators*—In order to obtain good commutation and to polish commutators, some operators mount wipers made of canvas or brussel carpet attached to small round sticks, bearing on the commutator and mounted half-way between positive and negative brush arms. This simple expedient increases brush and commutator wearing life materially.

3. *Streaky Commutators*—This is due to the plating rather than dusting action of some brushes. In general, this indicates improper brushes and necessitates the sanding or cleaning of the commu-

tator and the installation of correct brushes.

4. *New Brushes*—Instead of using standard carbon brushes, plating generators require brushes made of different compounds of metal, graphite and other materials which permit about twice the brush current carrying capacity. Brush holders operating at 30 degrees from the vertical, with direction of rotation against the toe of the brush and against the spring holding the brush in the holder, gives a brush seating which does not shift and hence better commutation. Since plating brushes are very hard and difficult to send in to conform to the commutator surface, it is often best to allow new brushes to wear in, starting first with a light ampere load.

### Operating Hints

Plating generator troubles are also caused by improper operation and care. Among the points to be reviewed in this category are the following:

1. *Freedom from Dust*—Plating generators must be blown out regularly and kept clean. Brush dust must be removed from undercut spaces between the commutator bars. Copper dust around generators is highly conductive and will cause much trouble from creepage.

[Continued on Page 89]

*With Speed, Space  
and Production the cry—*

**Let the Modern  
UNITROL**

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**method of housing and  
centralizing Motor  
Control help solve vital  
production problems**

Unitrol, a simpler, better way of housing Motor Control whether inside a machine, beside a machine, or in a centralized group . . . eliminates many of the operations, interruptions, and obstacles that stand between America and the production it must have.

If you are manufacturing important motorized machines with built-in control, Unitrol speeds up that process by eliminating any need for inside mounting bases, by eliminating many other machining, wiring and assembling operations.

If you have installed or are going to install Motor Control near a group of machines, Unitrol packs Motor Control into a much smaller space, enables you to move Motor Control out of the way, to utilize space otherwise wasted. It eliminates any need for special floor or wall preparation, saves many vital man-hours, conserves vital space.

If you are centralizing Motor Control for an entire plant, Unitrol enables you to do it better, faster, easier, far more economically . . . It enables you to get more than double the amount of control in the same space . . . It enables you to adapt your control to the space you have without further preparation or building expense. It expands and contracts easily, to follow your changing requirements.

No man concerned with the mounting, installation, use or maintenance of Motor Control; no man concerned with motorized machine production, can afford to overlook Unitrol. The whole story is told in the book "Unitrol . . . the next step forward in Motor Control progress." It's free for the asking. But write today—now—for your copy. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee, Wis. Associate: Canadian Cutler-Hammer, Ltd., Toronto.



← The individual Unitrol mounting frame is better for machines with built-in Motor Control. It eliminates many machining, wiring and assembling operations.

→ The individual Unitrol Section houses Motor Control for several motors or motorized machines, is compact, space-saving, convenient and economical. No supports, no other structures or preparation necessary.

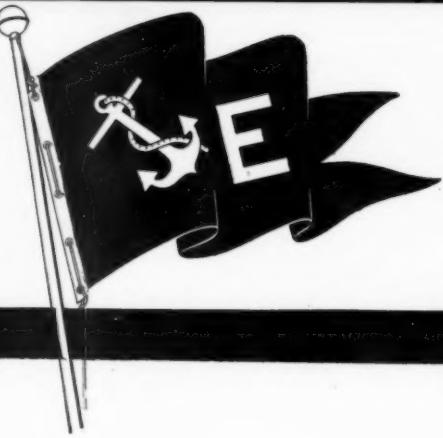


The complete Unitrol Control Center houses all the control and control equipment in the plant, for easy, speedy manpower-saving installation, maintenance, change, expansion or curtailment. No wall or floor preparation. No racks, trellises or frames. Permits installation of more than double as much control in same space.



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50th ANNIVERSARY



# The Navy's way of saying "Well done!"

THE men and women who work in our Electrical Wire and Cable plants now proudly wear the emblem bestowed by the Navy for notable production achievement. Formal presentation of the Navy "E" award was made June 17, 1942.

The entire American Steel & Wire organization is proud of this tribute, especially because production records are not made by plants and machines, but by the

men and women who operate them. The Navy "E" will be a constant inspiration to greater effort and still better records.

The government, of course, has first call on every foot of wire and every product we make. And every person in our employ is determined that wire and more wire, faster and ever faster, shall be our answer to the enemy until the day when Victory is ours.

## AMERICAN STEEL & WIRE COMPANY

*Cleveland, Chicago and New York*

Columbia Steel Company, San Francisco, Pacific Coast Distributors

• United States Steel Export Company, New York



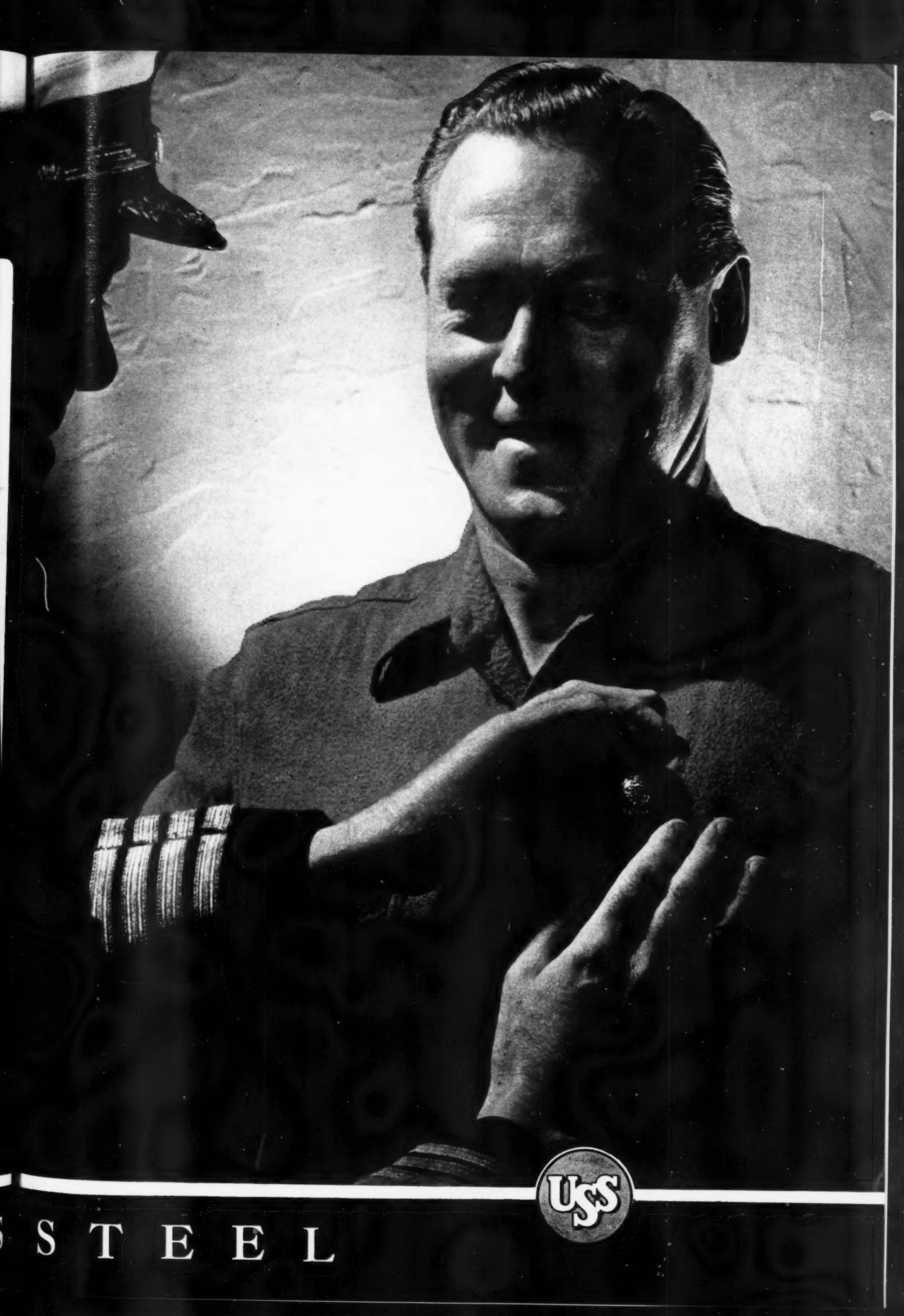
### ELECTRICAL WIRES AND CABLES

American Steel & Wire Company Electrical Wires & Cables are serving in the vital job of transmitting and distributing power and light. They are manufactured under the closest control, from the first operation to the last, and embody all latest improvements in design and construction.

UNITED STATES

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S T E E L



# Editorials

## Metal Substitutes

The electrical industry has leaned heavily upon metal during the past decades. Today war is forcing it to revert to non-metallic substitutes.

These are not entirely new. We have had porcelain; asbestos and fibre conduits; and slate and asbestos composition switchboards are familiar. Composition lighting fixture reflectors are replacing metal ones. But this is not sufficient.

There could be a further saving in metal through the substitution of asbestos and other non-metallic compositions for panelboard and other equipment enclosures; pull boxes; bus and cable enclosures and other types of electrical equipment. With the application of sound engineering this should be accomplished without sacrifice of safety. Grounding problems could be solved.

Contractors should bear such substitutions in mind. By living with jobs in the field they can make important suggestions. The ingenuity of the electrical industry is challenged. Let's help it come through.

## Added Responsibility

The urgency and complexity of war plant construction and conversion tends to increase the calibre of estimators in the electrical construction industry.

The present day estimator must be more than a "take-off and pricing man." His make-up must include a fair amount of engineering talent, job visualization, and a knack of knowing men. He must be able to detect flaws in plans and specifications; to coordi-

nate existing systems with added requirements in conversion work; to design complete systems to meet customers' needs.

Precious time and materials can be saved if the estimator can plan and engineer the job he figures. And competent men command the respect and trust of their customers.

Yes, added responsibilities are being piled on the shoulders of estimators. They must be, in reality, estimator-engineers. Both the customer and contractor benefit from this. And the electrical industry is becoming stronger because of it.

## Control Local

Close cooperation between the Building Commissioner and the inspection departments of the City of Memphis, Tennessee, has resulted in a unique method of insuring safe, high quality electrical installations.

The ruling of the Commissioner requires that the electrical, plumbing and heating permits be issued before the builder can obtain a building permit. Since permits are issued only to licensed contractors, rigid control is effected.

There are means of stamping out substandard wiring practices, if only we look around a bit and give it some real thought. Memphis has shown us one way out.

## Cut Electrical Fires

In a recent address before the Illinois Chapter, IAEI, Major A. B. Pattou, plant protection officer, Chi-

cago Ordnance District, revealed that the greatest cause of industrial damage is fire and the 25 per cent of all fires in war industries have been of electrical origin.

In a recent report of the Bureau of Fire Prevention inspections in Shreveport, La., Frank G. Camus, city electrician, reported 230 electrical defects in 334 inspections of buildings other than dwellings. In this 66 per cent, the most common violations were tampered fuses and worn cords.

Americans do have a gambling instinct—but it should cease where destruction of life and property are at stake. The contractor, inspector and plant electrician have paramount wartime duty on the home front—to cut the percentage of electrical fires to the barest minimum. Perhaps rigid requirements for the use of non-tamperable fuses is the answer.

## Man Power Scarcity

Under occupations in which there is a critical shortage of skilled men there are several electrical groups listed. Armature winders, coil winders, electrical testers, airplane and ship electricians are all in the critical shortage occupations according to a recent announcement from Washington.

This is no news to our industry. The shortage has been apparent in shops all across the country for some time. It has been further aggravated by the induction of many younger men under selective service.

One way that employers can help is to send deferment appeals to local draft boards when the case warrants such action. There is no element of draft dodging involved. The selective service system is set up to permit individual review. And in cases of scarce skills, the men are often of much more value to the war effort in their chosen occupation than behind a gun.

## Standardizing Our Language

In an industry as complex as ours there develops a degree of specialization that divides our separate interests and frequently creates a wide difference in nomenclature and definition.

Yet a common language and precise

definitions are important if we are to understand the work of those in adjoining fields. The American Institute of Electrical Engineers has contributed greatly to this common understanding in its publication of the American Standard Definitions and Electrical Terms.

This book is the result of 12 years work. More than three hundred individuals have contributed to it. It is authoritative and complete. It is our industry dictionary and its general use will do much to end the confusion all too frequently evident in specification phrasing.

## Depression Tactics

Some electrical contractors are still riding the old rut of "taking competitive jobs at cost" and banking on the "extras" to reap a profit. They take advantage of the numerous "forgotten items" that are overlooked in the wartime rush of grinding out electrical plans and specifications.

Such practices cause delays, confusion, lengthy justifications of extra costs, and, in general, leave a bad taste with all concerned.

Our job is to expedite war plant construction in every way possible. One way of doing this is to bring such "errors or omissions" to the attention of the owners or engineers before contracts are closed. Clean cut jobs are the easiest to handle. Re-adjustments made before signatures are applied invariably lead to speedier completion.

Let's be fair to ourselves and discard "depression tactics" for recognized fair business practices.

## Safety Is Urgent

In ordinary times industrial accidents are expensive. They affect compensation rates. They tie up expensive machinery. They cause loss of time and slow up the work. And besides that they result in serious personal losses to the victim. It is pretty obvious today that good safety programs pay off at the balance sheet. Their human value is incalculable.

These are not normal times. What about these safety programs in wartime? The same advantages accrue,

only their importance is amplified on a national scale. The complex interlocking of the war effort makes the individual worker's productive capacity and the output of his firm a matter of vital concern to the whole country.

Under the National Safety Council a "War Production Fund to Conserve Power" is being raised. The fund will help to establish safety programs in the 171,000 plants which are not adequately protected. It will contribute to a nationwide campaign to cut the deaths and injuries that are mounting with alarming rapidity as our production output climbs.

This is an important step in reducing the man power waste we cannot afford. In the meantime check your own shop and job practices. Practically all industrial accidents can be prevented. But a planned and well operated program is essential in these war times.

## Educational Movies

Moving pictures have come into their own as an educational medium in our country. Many contractors and motor shop men are becoming highly proficient in amateur movie circles. One shop in New Jersey recorded a complete motor repair job on film and showed it at trade schools for the edification and training of future motor repair men.

The same idea could be as applicable in the electrical construction industry. Movies taken of unusual installation procedures; solution of unique field problems, etc., could easily be shown at association meetings so all may benefit. With proper censorship at the time of shooting, such a program could add materially to our wartime construction.

It works in other industries. There's no apparent reason why it shouldn't in ours. It's worth a try, anyway.

## Fuse Service

Wartime conditions are causing some power companies to reverse their former "free fuse service" to consumers. To discourage such calls, they are instituting charges for service and replacement fuses, together with an educational program showing the "how

to" of fuse replacement, urging consumers to carry spare fuses and, if trouble continues, to call in their local electrician.

This opens another field of service for the local residential electrical contractor. By capitalizing on a nominal fee fuse service he helps himself and the utility. Fuses are the safeguard of the American home and when they pop it usually indicates some serious trouble. Contractors can investigate and correct defects.

Not only will this mean additional work for the contractor, but he will be doing his share in keeping up the wiring of existing homes and equipment—an all important phase of wartime living.

## Price Ceilings In Effect

In the news section of this issue is an up-to-date report on the progress of price ceiling regulations as they affect the electrical construction industry. For further instruction during this formative phase of price regulation the best method is to consult your nearest OPA office. A thorough study of the General Maximum Price Regulation and Regulations No. 136 and 165 are advisable.

In their present form, it is not easy to apply the rules to the pricing practices in use in our industry. Further, there is no simple method provided for proving good faith. It is up to each individual firm to do its best to operate within the law and to approach as nearly as possible to literal legal compliances.

Compliance difficulties do not relieve the contractor and his customer from full responsibility. In time, regulations may be amended to adapt our common pricing methods to the establishment of price ceilings. In the meanwhile it is vitally important that those methods provided for pricing and reporting be followed exactly.

In some instances exact compliance may be ruinous. There is, however, competent machinery within the OPA structure to relieve such cases. The formal procedure available should be followed whenever difficulties are encountered. Only through patient co-operation between contractors and OPA officials can we adapt our industry to the essential purpose and intent of the regulation.

# WIRING Methods

## TRAPEZOIDAL PULL BOX

The elimination of as many offsets as possible in long runs of large conduit is good engineering for it not only provides points of access to the conductors but also makes the pulling operation easier and reduces the danger of damaging the conductors.

Employing this principle in all its construction work, the Hixon Electric Co.,



**OFFSET ELIMINATED** by this odd shaped pull box eased pulling in of large cables in this parallel conduit run. Splices were made in the box.

electrical contractors and engineers of Boston install pull boxes wherever practicable and economical. In a recent large commercial electrical installation this company used a steel pull box, shaped like a trapezoid, to eliminate conduit offsets after passing through a cement block partition. Two 6-inch conduits, each with three 1,500,000 CM and one 750,000 CM cables, one 2-inch and one 1½-inch conduits enter one side of the box and leave the opposite side at approximately a 130 degree angle to the incoming lines.

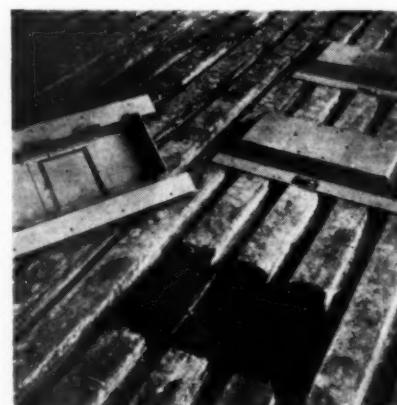
One end of the pull box is grouted into the partition while the rest of box is supported by four bolts which go straight through an air duct above to the concrete ceiling.

Being in an area congested with pipes, air ducts and machinery, it was difficult to make a straight-through pull. So the conductors were cut and two pulls made with the reels set up at this box and pulling tackle mounted at the two switchboard ends of the conduit run. Straight-through splices with solderless connectors were made in the pull box which is equipped with steel barriers between each circuit. A blank screw cover encloses the box.

## UNDERFLOOR CELL HANHOLES

Access to multiple cells in the Robertson cellular steel floor installation at the Municipal Fire Alarm Headquarters, Washington, D. C., is provided by handholes that cover two, three, or as many cells as are required.

Each individual cell is cut out so the adapter will fit over it. One hand hole in the center of the adapter is large enough so it can be used for the three cells. The adapter is bolted to the floor in the spaces between cells. The handhole cover can be removed and a nozzle



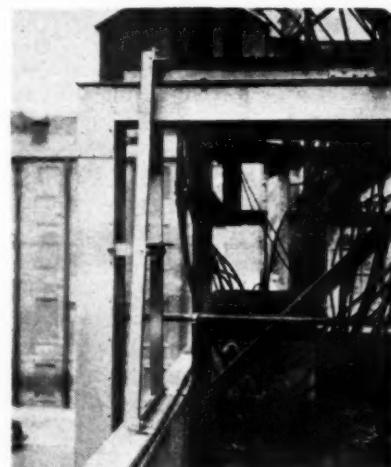
**MULTI-CELL** handhole provides access to three wiring raceways in this Robertson cellular steel floor installation at a municipal fire alarm headquarters where hundreds of circuits are needed.

attached, similar to other under floor wiring systems. With this type of raceway, access can be had at any point desired. The electrical work in the above installation was done by E. C. Ernst, Inc., electrical contractors of Washington, D. C.

## "A" FRAME BUSWAY SUPPORT

To support an outdoor feeder busway that ran horizontally, then dropped vertically over the parapet of a power house, A. Neri, Inc., Hoboken, N. J., electrical contractor used an "A" type of trestle.

The frame, made of heavy angle iron, is mounted on the building parapet and supports the I beam to which the hori-



**RIGID TRESTLE** of angle iron supports a right angle run of feeder busway extending over the building parapet. Both horizontal and vertical ducts are securely bolted to the "A" frame which is mounted on the top of the parapet.

zontal duct line is fastened, as well as the vertical run of duct at its center brace. Right angle bracing of the "A" frame is unnecessary since the horizontal I-beam duct support is securely fastened at regular intervals. There is no sway of the duct in any direction.

## PARAPET PLATFORM SPEEDS WORK

Instead of wasting time shunting around extension ladders to mount and service exterior building protective lighting units, the Associated Electric Construction Company, Melrose Park, Ill., designed a working platform that could be suspended from a building parapet.

This type of platform was used by this joint venture group on a large defense plant job. The unit is fabricated

# The New FA Dust-tight Panelboard for safety in dust-laden atmospheres



This panelboard is especially designed for use in shell loading plants, coal mines, coal storage rooms, flour mills and other places where dust is a hazard. It is approved by Underwriters' Laboratories, Inc., for "Class II, Groups F and G, Hazardous Locations," covering atmospheres containing carbon black, coal or coke dust and grain dust.

Instead of the usual steel front, consisting of trim and door, this panelboard has a solid steel front plate, gasketed all 'round, and secured with screws to the extra-wide flange. It is further rendered dust-tight with welded hubs for conduit outlets, welded box-corners, and handle bushings riveted directly

to the steel cover plate. The brackets are welded at the back. The circuits are externally operable by a mechanism of new @ design. The handles operate through the dust-tight bushings, and engage the regular handles on the circuit breakers inside the cabinet. ON and OFF positions are indicated on the front of the cabinet.

The panelboard is of the circuit breaker type, with either @ Type AC or @ Dublbrak circuit breakers; also other types of lighting branch-circuit circuit breakers . . . Capacities: 50 Amperes or less, for 3 wire, single phase, or 4 wire, 3 phase mains, with lugs only. Available with 4 to 42 circuits . . . Frank Adam Electric Company, St. Louis, Missouri.

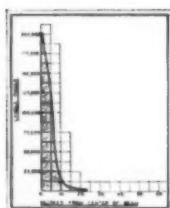


*New*

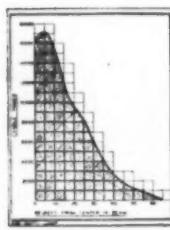
# PERMAFLECTOR FLOODLIGHTS



★  
Permaflector, the silver mirrored glass reflector which provides engineered light control, from extreme concentration to extra broad spread!



**Concentrated Distribution**  
Floodlights Nos.  
ST-1150-C, ST-1110-C.  
Addition of Stippled Cover  
Glass Provides Narrow  
Distribution.



**Broad Distribution**  
of Floodlights Nos. ST-1050,  
ST-1010.

Now! Speed night-time production . . . provide all-night protection . . . do either or both, effectively, efficiently, economically with the New Permaflector Floods!

Ideal for all outdoor floodlighting applications, New Permaflector Floods are:

- \* Quality-built. Rugged. Weather-proof, stand the gaff of heat and cold, rain and snow.
- \* Specially finished to resist corrosion.
- \* In 4 Wattages . . . 3 Light Distributions — concentrated, broad and intermediate.
- \* Complete! Ready to install. Quickly, easily mounted. Adjustable to almost any position!

Sold by better Electrical Wholesalers.

Cat. No.	Cover Glass	Incandescent Lamp	Distribution
ST-1050	Stippled	500-300 watts	Broad
ST-1150	Stippled	500-300 watts	Narrow
ST-1010	Stippled	1000-750 watts	Broad
ST-1110	Stippled	1000-750 watts	Narrow
ST-1150-C	Clear	500-300 watts	Concentrated
ST-1110-C	Clear	1000-750 watts	Concentrated

Standard Quantity—1 Approx. Net Weight Each—35 lbs.

WRITE FOR WAR  
TIME SUPPLEMENT  
TO CATALOG 40,  
showing  
Floodlights and  
Industrial Units  
employing  
minimum critical  
materials.

**PITTSBURGH  
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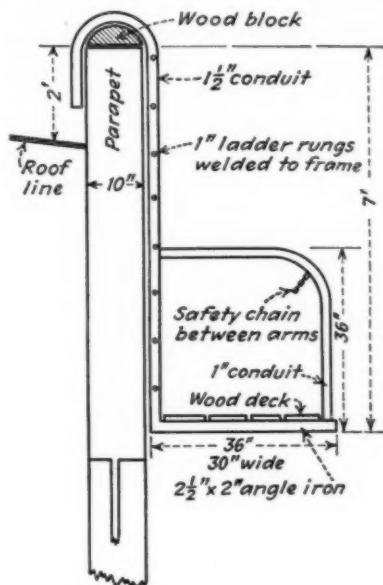
*Tear Off*

Clip to letterhead.  
Sign. Mail for  
complete informa-  
tion, prices.

## WIRING Methods

[FROM PAGE 30]

from 1½-in. and 1-in. conduit for the hook ladder and guard rails; and wood decking on a 2½-in. by 2-in. angle iron platform frame. The platform itself is 36-in. high and is equipped with a safety chain between the arms. The height of the unit illustrated is seven feet, but this dimension will vary with the mount-



**HOOK LADDER** and platform combination facilitates mounting and servicing protective lighting on building exteriors. It eliminates the need for extension ladders and ground crews.

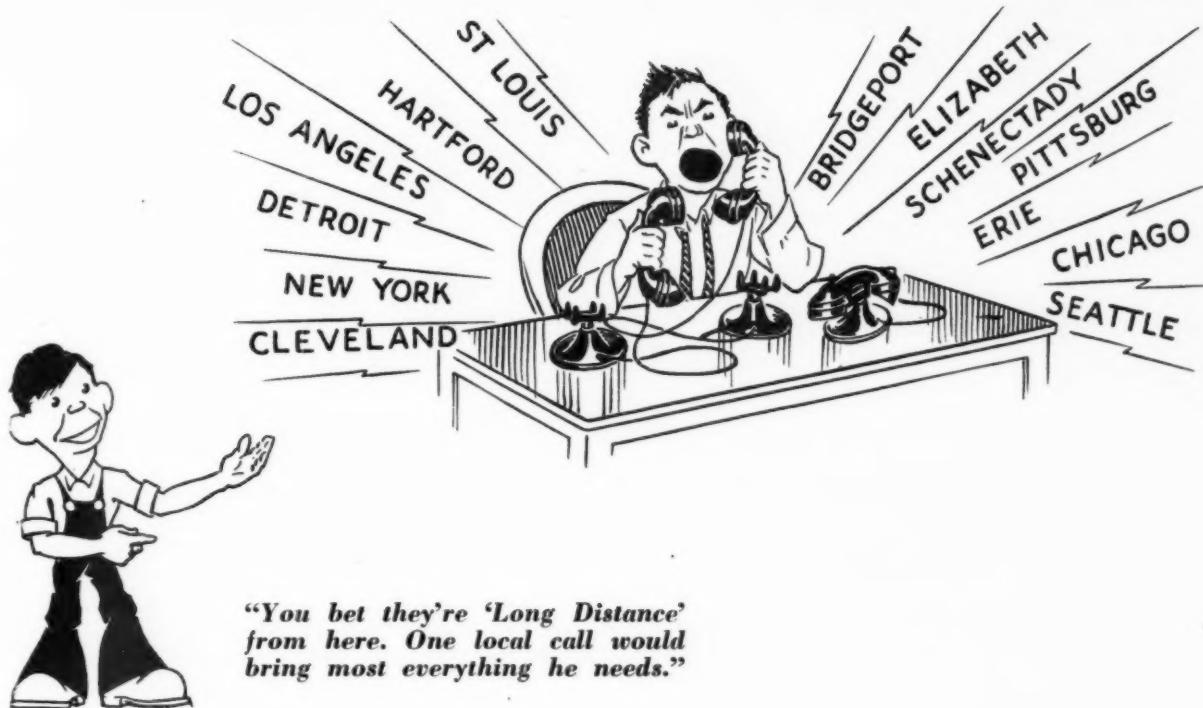
ing height of the fixtures. A wood block, inserted between the parapet top and the ladder hook, cushions the platform and prevents chipping the parapet.

By using this device, a two-man crew could make real time on outdoor fixture work and one man could easily service the fixtures from the building roof. The sketch shown gives the construction details of the platform.

## DEMOUNTABLE WORKING STAGE

Hanging fixtures in a large area with uniform conditions can be speeded by prefabrication and a versatile movable working platform, Lloyd Flatland of Globe Electric Works, San Francisco, proved in a recent large Federal building job.

Prefabrication consisted of wiring fixture hangers at the shop, providing them with measured circuit wiring to the required junction box, labeling each, and boxing them for each bay or section of the building. Working then from the



*"You bet they're 'Long Distance' from here. One local call would bring most everything he needs."*

## For PARTS

— wanted in a hurry for repairs and replacements, call your near-by

### ELECTRICAL WHOLESALER

ARRANGE with him to maintain stocks for your use—rather than force yourself to deal with manufacturers who themselves are frantically trying to catch up with their own War schedules. No one manufacturer, or a dozen, or a hundred, can give you the tireless personal attention and priceless War-time services offered by the local Electrical Wholesaler.

Since we know this to be true, we distribute all T & B products exclusively through the T & B Electrical Wholesaler and his competent service organizations.

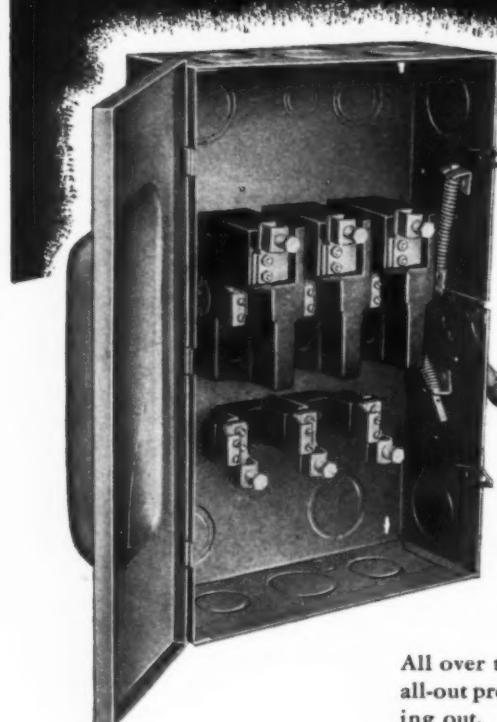


**THE THOMAS & BETTS CO.**  
INCORPORATED  
MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899  
ELIZABETH, NEW JERSEY

TIME IS RUNNING OUT



THERE'S NO TIME  
FOR PRODUCTION BLACKOUTS



Switch to  
**FEDERAL**  
**SEALED**  
**ARC**

**SAFETY SWITCHES**

All over the country plants are swinging into all-out production for Victory. But time is running out. There's no room for switch failure. That's why leading manufacturers are switching to Federal "Sealed Arc" Safety Switches for

every industrial application. They do the job—quietly and efficiently—when the pressure's on.

You're sure to find many advantages in Federal Safety Switches—in their trouble-free operation on essential circuits—in their "Sealed Arc" construction that confines the arc inside a porcelain casing to prevent arcing to metal parts—in their ribbed arcing chutes that break up and snuff the arc—in their patented "grip-tite" clamps for better contact—and in the other exclusive Federal features.

Today, when uninterrupted power is vital for continued production and Victory, switch to Federal "Sealed Arc" Safety Switches to carry the load.



**For Complete Safety Switch Data**

write for Bulletin 21-40S. Get all the essential facts on Types A, C and D Federal "Sealed Arc" Safety Switches.

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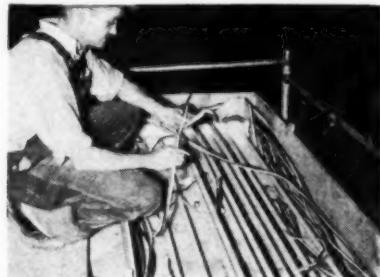
PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

WIRING  
*Methods*

[FROM PAGE 32]

top of the movable platform the electricians had the fixture hangers all ready to hang, the wire ready to pull, and work on the job was simplified to switch connections and connections to the main feeder circuits.

The movable platform was a deluxe version of the typical wooden staging usually made up on the job and demolished when the job is done. Instead, this was carefully made up in demountable sections at the shop, assembled for each floor, disassembled to move to the next floor. It was fashioned of steel



FIXTURES ASSEMBLED and wired, lifted to the top of the platform in boxes are ready to hang, the wire cut and measured ready to pull and connect up, circuits are tagged and identified.



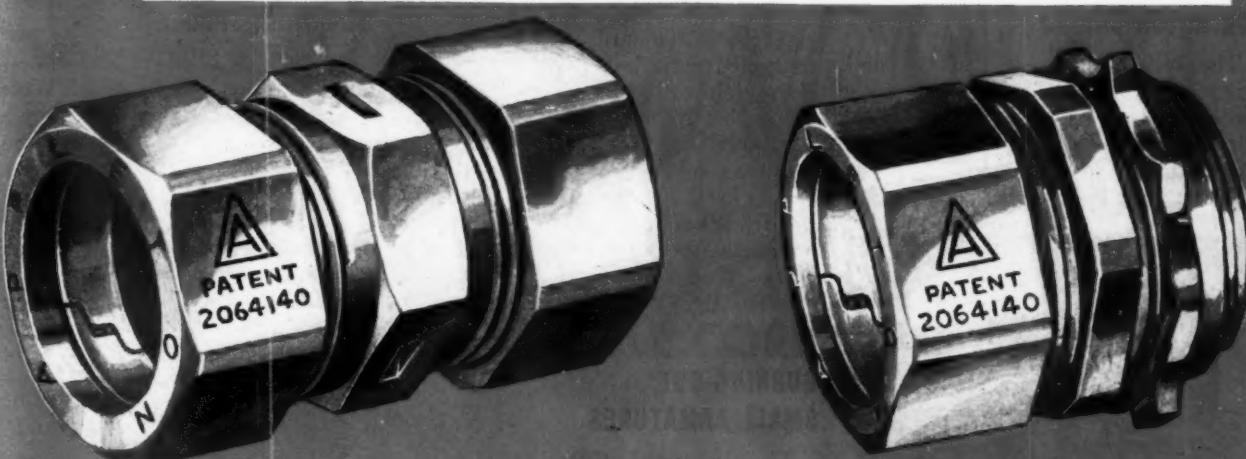
TOP PLATFORM is safe and convenient. A ladder is strapped to the side. Davits lift materials. The whole scaffold rolls on rubber tires.

tubing, (EMT) welded, and where demountable, bolted. The working platform could be raised or lowered by means of built-in winches to adjust to ceiling heights. The top was equipped with davits with block and tackle to lift the crates containing the materials, fixtures, tools, etc.

Four small balloon pneumatic tires, on steering knuckle hung wheels, permitted easy movement of the platform over the floor even over minor obstructions. A cable reel or two provided wire for circuit runs if needed. A length of flexible cord furnished power for hand tools and soldering irons.

*More Now in Service  
Than all Others Combined!*

**APPLETON COUPLINGS AND CONNECTORS  
FOR ELECTRICAL METALLIC TUBING**



**There are sound reasons for this outstanding Appleton leadership!**

Appleton Gland Ring Couplings and Connectors make a rigid, permanent tubing connection that is **approved watertight!**

The concave, piston ring type of gripping ring insures an easy fit on tubing cut in the field with a hack saw, thereby assuring a positive grip and extreme rigidity in the completed installation.

It is not necessary to use more than *one type* of fitting when you standardize on Appleton Couplings and Connectors. They are expertly designed, and made in Appleton factories to high specification standards. They embody every important improvement for fittings of their type. Heavily cadmium coated.

All sizes have hexagonal nuts, and hexagonal center sections, which are easily held rigidly with a wrench while tightening. Connectors have high knockout closing shoulders, and are equipped with bonding type lock-nuts, which fasten securely to outlet boxes, panel boxes, and other equipment. Competitively priced!

Appleton service on priority-rated orders is complete and dependable. Costly delays are avoided by specifying *Appleton Fittings — STANDARD FOR BETTER WIRING!*

*Sold Through Wholesalers*

**APPLETON ELECTRIC COMPANY**

**1704 WELLINGTON AVENUE CHICAGO, ILLINOIS**

Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 203 Luckie Street, N.W. • BIRMINGHAM, 6 N. Twenty-first Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 418 Bessemer Bldg.

Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle.



The name "Appleton," the registered trademark, "Unilets;" or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. We manufacture no private brand goods!



ENTRANCE FITTINGS, CLAMPS, ETC.,  
ARE ALSO AVAILABLE FOR USE  
WITH ELECTRICAL METALLIC TUBING

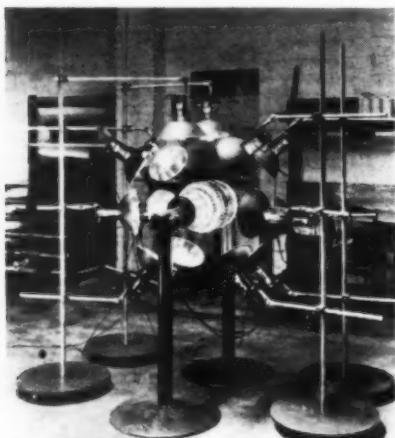
**APPLETON**

Conduit Fittings • Outlet and Switch Boxes • Explosion-Proof Fittings • Realites

# Motor Shops

## INFRA-RED ARRANGEMENT FOR ROTOR BAKING

The Wiles Electric Co., of Portland, Ore., electrical contractors and motor specialists, replaced an electric oven containing heating elements aggregating 2000 watts with this infra-red lamp installation for baking and dehydrating.



**INFRA-RED BAKING** and drying oven can be used around the shop. Units are mounted on heavy rolling bases.

It is said to do a better job more economically on rotors and in fact upon any coils that can be suspended at the focal point of this high-power lamp battery. The photograph shows a rotor of a 25 hp. crane motor treated with No. 9603 clear baking varnish and baked hard in two hours.

Here, the adjustable reflectors are mounted one foot from the surface of the rotor, in an arrangement approximating spherical. At that distance they throw a light pattern 10 inches in diameter on the rotor, lights being adjusted to give a two-inch overlap.

The installation as arranged for this piece of work consists of 14 Type IR reflectors with 250-watt PS 30 Fostoria lamps. The reflectors are carried on arms attached to vertical standards by means of adjustable clamps. The heavy bases of the standards run on swivel casters. The standards are independent of each other and each normally carries

four lamp arms. In this particular set-up only three reflectors are used on the right hand standards. The lamps are connected in series on 220 volts.

Previous to the adoption of the infra-red, such a rotor required 10 hours baking time and 20 kwh. of electrical energy, as against the present two hours and  $3\frac{1}{2}$  kwh. The mountings were made in Mr. Wiles' shop, with the exception of the two pedestals carrying the rotor shaft. The whole equipment cost approximately \$150.

## BURNING OUT SMALL ARMATURES

The Industrial Electric Co., motor service shop of Indianapolis, Ind., gets double duty out of its test growlers. When not used for test purposes, the growlers are put to work burning out small armatures for direct current motors.

The commutator of the armature is shorted by wrapping a piece of bare copper wire around it. Then, the counter balanced growler is lowered on to the armature windings and the cable plugged in. The armature windings



**THE HEAT'S ON** this small direct current armature as induced currents from the growler melt the compound and insulation on the windings to be stripped.

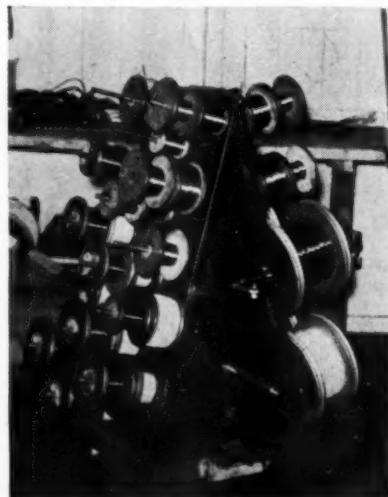
then act as a shorted secondary of a transformer and heat up sufficiently to melt the compound and loosen the insulation to such a degree that the windings can easily be stripped.

By using this scheme the danger of overheating and warping the armature cores is reduced. Armatures up to 3 hp. in size can be burned out by the growler illustrated. It takes approximately 15 minutes to do a 1 hp. rotor. The growler is used on either a 220- or 440-volt single phase circuit.

## PORTABLE RACK FOR WIRE SPOOLS

The A. L. Brown Associates, Inc., motor repair specialists of Worcester, Mass., believes in having shop equipment as flexible as possible. So they make as much of it portable as is practicable.

Working along these lines, they recently built a portable steel rack for active magnet wire spools. It consists of two sheet steel sides which form an "A" shaped unit, supported at the base by an angle iron frame resting on four



**HANDY PORTABLE RACK** for active magnet wire reels uses inherent friction as a tension device so wire can be unreeled directly to winding machines.

casters. Steel cross pieces bridge the central points of the open ends. The sides make approximately a 30 degree angle with the vertical.

Mounted at right angles to one of these sides are 15 steel pins of sufficient length to accommodate two spools and located so all spools will rotate freely. The other side (right in photo) has fewer pins, but takes larger reels. One end of the unit has a large steel pin mounted by an L-shaped bracket to the supporting base. This is used for larger reels and has a tension device mounted on the cross piece directly above it. A

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO

# CRESCE NT



# PERMACORD

## WELDING CABLE AND PORTABLE CORDS AND CABLES

WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE

### Use Minimum Rubber

Heavy, hard-twisted cotton outer jacket over adequate rubber insulation gives maximum protection from abrasion, heat, oils, greases and weather to the super-flexible copper conductor. The use of this fabric jacket results in a saving of over 75% of the rubber usually employed in high grade welding cable.

PERMACORD heavy-duty, jacketed PORTABLE CORDS and CABLES are available in all sizes from #18 A.W.G. to 1,000,000 C.M. and offer the same advantages as above.

*Safe — Durable — Economical*

**CRESCE NT INSULATED WIRE & CABLE CO.**



**CRESCE NT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE**



Here's Why  
**GREENLEE  
BENDERS**  
save 15% to 75%  
IN TIME AND LABOR COSTS

As good man power becomes scarcer in the present emergency, increase the efficiency of your men by turning to a better use of tools. Let Greenlee Benders help you speed up construction by making the work easier and faster for the man on the job. Greenlee Benders are daily saving contractors from 15 to 75% in time and labor costs.

**EASIER AND FASTER**

To make the job of bending conduit easier and faster, two sizes of hydraulic power units are used on Greenlee Benders. The No. 770 Power Unit, with a maximum piston pressure of 25 tons, has been designed for fast bending of small conduit up to 3-inch. The larger No. 775 Power Unit, with a maximum pressure of 40 tons, has the extra power needed to bend the larger conduit and pipe from 3 to 4½ inches.

**ONLY ONE MAN TO OPERATE**

One man pumping the handle can easily develop the power required to make accurate bends in 1¼ to 4½-inch material without kinking or distortion.

**PORTABLE, EASY TO SET UP**

These light, portable Greenlee Benders are built compactly into one unit and are easily carried to the job and set up, and will not move or twist about when in use.

**BENDS RIGHT ON JOB**

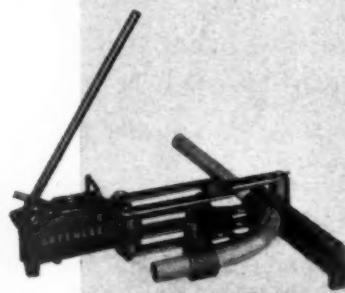
By bending right on the job you save the cost of many manufactured bends and fittings, and also the cost and time of cutting and threading nipples. Material is bent cold without filler.

**A BENDER FOR EVERY JOB**

Whatever you have to bend... tubing, conduit, pipe, or bus-bars... there is a Greenlee Bender to do the job. Small hand benders will bend tubing from ¾ to 1½-inch, while Hydraulic benders are available for bending 1¼ to 4½-inch material. Write today for Bender Booklet S-116, describing the complete line of Greenlee Benders.



No. 770  
Rigid Conduit  
and Pipe Bender



No. 770-T  
Thin-Wall Conduit  
Bender



No. 763  
Steel Tube Bender

*Motor Shops*

[FROM PAGE 36]

similar bracket can be mounted on the other end of the rack.

The rack can be pushed up to a winding machine and the wire unreeled directly to the coil forms. No intermediate tension device is necessary. The friction of the spools on the sides of the rack and on each other provides sufficient tension for winding purposes. The tension device on the cross pieces is used for the large reels supported by the end pins at the open ends of the unit.

**WINDING  
TRANSFORMER COILS**

Instead of winding transformer coils in a lathe, as many shops do, the Jay Electric Co., Detroit, Mich. has designed and built a multi-speed winding head for just such work. Thus the lathe is free for other machining operations.

The mechanism consists essentially of a gear reduction box mounted on an angle iron table. The gears are chain driven by a 3 hp., 3-phase, 220 volt, 900 rpm. motor mounted under the top of the gear box supporting frame. The horizontal shaft extending from the gear box is equipped with an ordinary lathe chuck to hold the shafts of the various coil forms.

Through the combination of two gear shifting levers, ten different speeds varying from 26 rpm. to 460 rpm.; can be obtained. A chain driven counter,



TRANSFORMER COILS are wound on this specially designed winding head. A double gear shift provides a 10 speed range from 26 to 460 rpm.; also reverse speeds.

**GREENLEE TOOL CO.**

1748 COLUMBIA AVE.      ROCKFORD, ILLINOIS

TOOLS TO MAKE THE ELECTRICIAN'S JOB EASIER

# Uncle Sam's War Needs Require Lighting Which Permits Maximum Production Every Hour... Every Day



*RLM Silvered Bowl Diffuser*



*RLM Symmetrical Angle Reflector*



*RLM Deep Bowl Reflector*

- Skilled workers are at a premium. Through them and only through them can high standard production of vital war goods be maintained.

Since over 80 percent of human activity is governed through the sense of sight, the eyes of these war plant workers are industry's most important tools. Good light helps good eyes do more. It is even more helpful to the older skilled workmen, whose experience is so essential to efficient operation of every shift.

When making plans for lighting to meet the needs of today's high speed and multiple-shift operation, play safe by specifying lighting bearing the RLM LABEL. Adequate

lighting—directed for maximum efficiency and energy conservation—depends to a large degree upon the basic design and construction of the lighting equipment. When you purchase lighting units bearing the RLM LABEL you know that exacting laboratory and engineering tests have proved them highly efficient, economical to maintain at their original lighting efficiency, able to withstand vibration and heavy duty service, and uniform in quality.

Only Industrial Lighting Units built to exacting RLM Specifications and certified by Electrical Testing Laboratories are permitted to carry the RLM LABEL. Write for booklet, "The Meaning of the RLM LABEL," and Complete Set of RLM Specifications.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

**RLM STANDARDS INSTITUTE**

INCORPORATED  
307 N. MICHIGAN AVE. SUITE 1600 CHICAGO, ILL.

*RLM Dome Reflector*

*RLM Fluorescent Unit*

**IDEAL** for a wide variety  
of transformer needs-

# NEWARK

STANDARD DRY TYPE  
**TRANSFORMERS**

## IDEAL—because . . .

- they need no fireproof vaults.
- they can be used where oil insulated types are banned by insurance codes.
- they are light and compact and easy to install.
- they are adapted to direct wall mounting or to duct or conduit wiring.
- they need no maintenance—ever.
- they are backed by 20 years successful transformer engineering and manufacturing experience.

## FULL DETAILS IN BULLETIN A-10

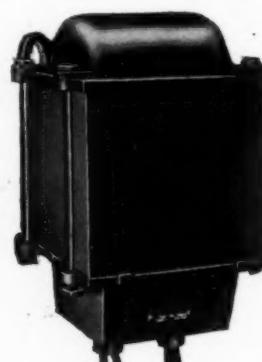
Write for a copy—today



Type P



Type O



Type N

NEWARK also engineers and builds transformers to special needs. 20 years experience at it is your assurance of promptness and satisfaction. Tell us your needs. If you can furnish priority—we can deliver.

**NEWARK**  
  
**TRANSFORMER CO.**

23 Frelinghuysen Ave. NEWARK, N. J.

TRANSFORMERS FOR ALL PURPOSES

**Motor Shops**

[FROM PAGE 38]

mounted on the gear box, indicates the number of turns wound on the coil form.

The machine is located in one corner of the shop in front of reel racks for paying out the wire. Separate and integral tension devices are a part of the reel rack mechanism.

## PARTS BOX DISCUSSION

"A mechanic's 'perhaps' can be as important a word as a woman's 'because'", said A. R. Knizze, service man for the Bartlett Electric Co., Portland, Ore. "Perhaps" you act as servicing agent for a specific line of small motors as we do. Such a line, as you know requires a considerable line of small parts and accessories such as many sizes of gaskets, bushings, grease retainers, gears, bearings, etc.

"Perhaps" you have these all neatly filed away in cabinet drawers where you have to walk a considerable distance



SECTIONED BOX and fasteners make this useful and handy stock kit to hold small parts and accessories for small motor repairs. Each part has its place.

and back for a single small piece. 'Perhaps', instead of that, you have them, as I did all in a box close at hand on the bench. Theoretically this is all right, but they soon get jumbled up and about as much time is required to find an item as to telephone the distributor to deliver one by truck.

"Perhaps" you might try, as I did, to put some system into that box (10-by 30-by 6-in.) by putting fasteners on the inside of the cover for each size of gasket and 'departmentalizing' the interior of the box for the various other parts, so that the endless pawing and hunting is done away with.

"Perhaps" this is an important idea worth writing about and 'perhaps' it is not. Anyway, it has saved me a lot of time."



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# Machine Tool Builders . . .

*the men behind our war production achievement*

IT TOOK GERMANY six years to get ready for this war, and Japan even longer. But in less than twenty-four months American industry, starting from scratch, has caught up with and surpassed the war production of the Axis.

When France fell in June, 1940, we unfortunately had no gigantic munitions makers, like the Krupp or Skoda works, to turn to. We had been devoting our attention to making refrigerators and vacuum cleaners and motor cars and lawn mowers. Ordnance output for our Army was a mere million dollars a month. A sad commentary on our National state of mind and our lack of responsible political leadership.

Yet during June of this year, our industries, transformed from peacetime pursuits, produced close to a thousand times that amount. A thousand-fold increase in two years!

The same spectacular gains hold throughout our war program—for ships, planes, guns, tanks, a thousand items. We are well on our way toward the 60,000 planes, 20,000 anti-aircraft guns, 45,000 tanks and 8,000,000 tons of shipping that the President asked us to produce in 1942, and toward the much larger production projected for the year 1943.

We are well on our way thanks to a number of factors, one of the most vital being the extraordinary job done by the machine tool industry. For it has equipped America's metal-working shops with the tools they need to turn out the vast quantities of war weapons.

The machine tool industry's importance springs from the fact that almost every metal product, from mechanical pencils to giant guns, is made with machine tools. They transform pieces of steel into parts for automobiles, farm implements and radios—and for airplanes, guns and tanks.

The Garand rifle, highly praised by General MacArthur at Bataan, has 72 metal parts requir-

ing 1040 separate cutting operations on machine tools. A 40-millimeter gun mount is made up of 1500 separate parts, built to the tolerance of a Swiss watch. Each part must be machined, not once, but several times.

No wonder that when the American defense program was undertaken two summers ago, the American machine tool industry was the first to be called into service. Ninety-five thousand machines were wanted as quickly as possible from 250 builders who in peacetime had produced some 25,000 machines a year.

But the demand did not stop there. The Army, the Navy and the Air Force kept asking for more as the war production program was expanded again and again. Nor was that all. The entire anti-Axis world besieged Washington with urgent requests—from London to Moscow, from Ottawa to Chungking.

To a man the machine tool builders responded. New factories and additions to old plants were built, with deliberate disregard of the prospect that all these sharply expanded facilities could not be used after the war.

To increase output from existing plants practically every company went to two long shifts or three short ones. The industry's work-week was greatly extended. From the beginning of our effort, it has been the longest of any industry.

Working forces were enlarged from 40,000 to 110,000, and this latter figure does not include tens of thousands of employees with sub-contracting firms. Though machine tool building requires a higher degree of individual skill than most products, "learner" courses have been set up to train men quickly. Over 15,000 men and women now are in training.

The machine tool builders were among the first to go in for sub-contracting. They have farmed out parts, subassemblies and complete

machines right and left. To meet their needs, for example, repair shops of carpet mills are making milling machines, a laundry machinery company is producing radial drills, and an automobile body builder is making planers and boring mills.

Machine tool manufacturers quickly shelved peacetime practices to concentrate manufacture on the sizes and types of machines critically needed for the war program. They adopted mass production methods wherever possible, although machine tools are essentially a tailor-made product. They sent their sales engineers, as did machine tool dealers also, to hundreds of munitions makers with invaluable advice as to tooling up most efficiently for their particular jobs.

The swift action taken by the machine tool builders shows what private enterprise can do to meet a national emergency. They were the first to institute a voluntary system of priorities.

All of this involved an almost explosive expansion of the industry. Machine tool builders produced an average of only 7,500 machines a year from 1931 to 1934. In an ordinary year, output totals 25,000 machines. But in 1940, it rose to 112,500, and in 1941 to 187,500.

The 95,000 machine tools wanted for the original defense program were built and delivered within eight months.

*Today more than 1,000 machine tools are being shipped to war factories every twenty-four hours, and for seven days a week. Each month's output exceeds that of an entire normal peacetime year and is five times that of the depression year of 1932. And each succeeding month is shattering all previous records.*

It is this amazing performance that led Under Secretary of War Robert P. Patterson to declare that "machine tools are the foundation on which our production structure is built. American machine tool men are doing a stupendous job. Machine tools are now being turned out at a rate of \$1,380,000,000 a year. Machine tool designers have worked to improve tools so much that machine tool effectiveness today is one-third to one-half greater than it was in 1930. Our production today is 16 times what it was—in capacity to cut metal—at the peak of the World War."

The results of this performance by this key industry, so satisfying to the Nation, do not spring wholly from the numbers of machine tools produced. They stem also from their improved quality and greater productivity.

Today's warfare differs radically from that of 1917-1918. It calls for mechanized weapons so complicated in design and built to such a fine degree of accuracy that they are beyond comparison with the weapons of a generation ago.

Machine tools, completely redesigned during the depression years, are meeting these new and exacting requirements. In addition, thousands of machine tools of special design, without counterpart in peacetime work, have been built.

*The record of the war industries most directly dependent on the machine tool industry speaks for itself. One tank manufacturer alone is producing more than thirty big tanks a day. A midwestern plant is completing 35 anti-aircraft guns a day, round the clock without interruption. A tank engine factory, tooled up to make 650 units a month, is actually building over 1500 a month. Demolition bombs, destined for Berlin and Tokyo, are being made by the tens of thousands every month. Machine guns are being produced at a rate of 50,000 a month.*

These manufacturers, all machine tool users, are far in advance of the timetables set for them.

All this is good news for the American people and bad news for the Axis. It is proof that American industry, with each individual and specialized industry doing its part, is living up to the faith put in it by the American people.

But it is more than that, too. It is a guarantee of our confidence in the peacetime future of American industry and of the free enterprise system under which this miracle has been wrought.

Perhaps more than anything else, the foundation of that confidence must be faith in the farsightedness, the ingenuity, the engineering and designing skill, and the managerial know-how of the machine tool makers.

On them we depend for the most essential tools of the post-war production economy. Without them, our vision of better living standards and full employment through more efficient production and distribution can never be more than a vision.

What they have done as the toolmakers for war is proof of what they can do as the toolmakers of peace. How they have done it as free men is a demonstration of what free men will do.

*James N.M. McGraw, Jr.*  
President, McGraw-Hill Publishing Company, Inc.

#### THE FALL OF TROY

Intelligent advance preparation—work before the battle—has always weighed heavily in the decision. The men who conceived and built the wooden horse prepared the way for Grecian victory.



**FAMOUS BATTLES** of modern times, too, can be won or lost behind the lines, before the battle. America is awake to the all-important part production plays in Victory. Fighting shoulder to shoulder with the brave men at the front, the workers in the Arsenals of Democracy are rendering an invaluable service. Getting this vital equipment where it is most urgently needed places a great responsibility, too, upon distributors and dealers. American Blower Distributors and Dealers are doing all in their power to speed deliveries, place Fans, Blowers, Unit Heaters and Ventilators where they are needed most, render prompt, dependable service to keep production lines rolling. You can always count on their cooperation.

## AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN

In Canada: CANADIAN SIROCCO COMPANY, LTD., Windsor, Ont.

Division of AMERICAN Radiator and "Standard" Sanitary Corporation



"**E**" WE ARE PROUD that we of American Blower, through our efforts to produce quantities of vital equipment in the shortest possible time, have received the coveted Navy "E" Award for production.

# Estimating

## LABOR FLUCTUATION CURVE

In a recent discussion on the justification of "specialist" contractors, J. Walter Collins, Electrical Contractors Association of City of Chicago, presented an analysis of the labor fluctuation for electrical work on an actual war plant job.

Experience, talent, equipment, skilled labor and other resources are always fostered as a reason for better efficiency and greater economy effected by the use of specialist contractors in specialist trades. The ability of such contractors to fill in the valleys of the labor fluctuation curves of separate jobs—when taken over a series of jobs—is another strong point for the specialist organization. By intelligently shifting men from one job to the other, a comparatively smooth employment curve can be obtained, eliminating wholesale layoffs as might occur if individual plants or general contractors were to hire and fire as employment peaks in specialized trades occurred.

The accompanying chart, produced by the Research Dept., Electrical Contractors Association of the City of Chicago, is plotted from an accurate tabulation of men employed on the electrical work on one war plant job recently completed. It delineates the creation, development and disintegration of a single trade on one particular job. It is cited as a comparable example of a general contractor operation having one large job at a time, or having jobs separated by distance requiring reorganization in each case.

From a study of the chart we find that on this job, starting during the survey and substructure periods, there were about two months in which a small crew of men were employed. The following two months found a slight increase as the super-structure progressed, intense recruiting took place and employment increased abruptly until the peak of 367 men was attained in the 34th week of building construction. The succeeding weeks showed a rapid decline in employ-

ment as the job progressed into its final stages. The last two months had an employment level comparable with the first two.

Most of these men were employed elsewhere at the start of the job, with the exception of inexperienced men as "fill-ins" for odd tasks with the skilled group, at skilled labor wages. If this job was out of the hands of a specialist contractor to gain the peak, it might be necessary to induce men from other equally important jobs by the usual inducement of fatter pay checks, affecting both the efficiency of the new job and the other jobs from which the men were taken.

The employment curve shows that the ascent to and descent from the peak were comparable—meaning that men induced from other jobs would be cut loose again to seek other jobs or enjoy a "forced vacation" until other job inducements were found.

A study of the chart also discloses that 70 per cent of the men were employed

only 23 per cent of the construction period. Assuming that complete re-employment was accomplished in five days time, 1,835 man days of urgent production would be lost through this project because of lack of continuity of employment.

Work of this type in the hands of a specialist employer or contractor would not show this radical condition—in an overall condition. A specialist employer would contract other work under several general contractors, or industrial plants, which could be timed to avoid the severe peaks and valleys and thousands of manpower days would be saved for the all necessary exigencies of the times.

An analysis of the above curve might prove helpful to specialist contractors who are attempting to prove the necessity and propriety of using their services, if and where time and expense are of any consequence in the transaction.

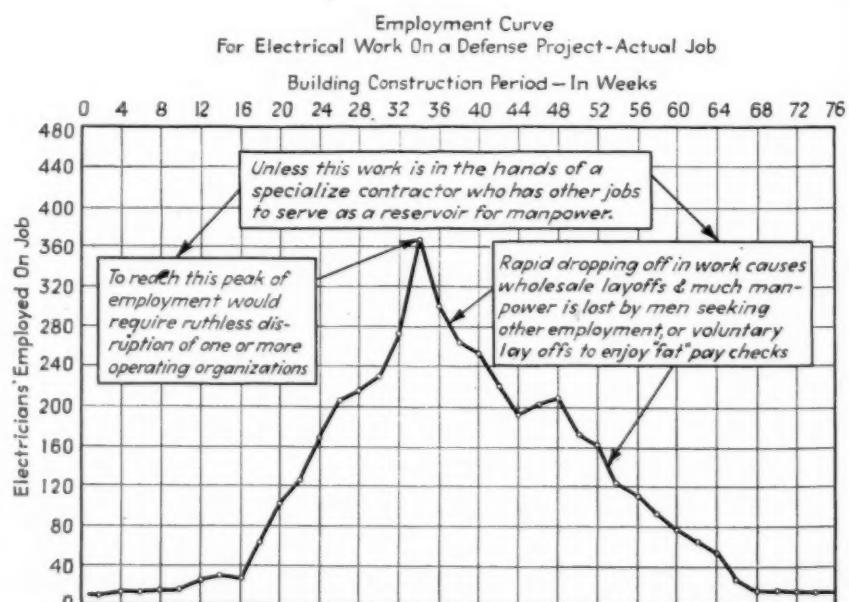
*Data from Electrical Contractors Association of City of Chicago.*

## ESTIMATING GUIDES

### —Lighting Branch Wiring

Item six of the "Estimating Guides" series based on the outline of the Electrical Contractors Association of the City of Chicago, deals specifically with the lighting branch circuit wiring—what the take-off should cover and how to check the listing.

The importance of the lighting layout in modern industrial and commercial construction cannot be overemphasized.



**PEAKS AND VALLEYS** of electrical construction employment on an actual war plant job. On this job 70 per cent of the electricians were employed only 23 per cent of the construction period. When integrated with other jobs, specialist contractors level off extreme peaks and valleys and stabilize the employment of their men—saving precious skilled labor man-hours.

AN ELECTRICAL WHOLESALER HELPS SPEED WAR PRODUCTION



## WESCO'S 24-hour service sped 3-shift war job

### WESCO SPEEDS PRODUCTION

- \* U. S. ammunition depot required lighting for urgent night-time operations, yet no wiring or electricity was allowed in building. Wesco engineer solved problem and met 3-week deadline.
- \* A steel plant urgently needed 18 different electrical products. Delivery promises by manufacturers ranged from 60 days to 9 months. Complete order delivered by Wesco in 3 days!

### WESCO SERVES BUSINESS

- \* By offering prompt delivery of electrical items from large stocks.
- \* By maintaining perpetual inventory stock records.
- \* By providing trained sales and engineering personnel.

### Supplied 125 Products from 10 Makers to Complete 2½ Acre Building in 60 Days

Orders were flashed to Utah to build a 3-story Army Corps Administration building covering 2½ acres. A three-shift army of mechanics and workmen took over in heavy snows and temperatures ranging down to 7° below zero.

The local Wesco House went on a 24-hour basis, 7 days a week. Its job was to rush to these men a constant supply of 125 different electrical products made by 10 manufacturers in quantities, as needed, day or night. Stock rooms, shipping department and trucks were continuously manned. The Wesco representative answered emergency phone calls at all hours of the night and started material on its way through the blizzards.

Wesco's alert service and diversified stocks have always met the demands put upon them. On the final day, the huge building stood ready for the Army to move in. Wesco's "know how" was learned during 20 years of peace. Today that ability is devoted to Victory; then it will again serve business with increased experience and efficiency.

*The name that means  
everything in electricity*

**Westinghouse**  
**ELECTRIC SUPPLY CO.**

150 VARICK STREET • NEW YORK, N. Y.

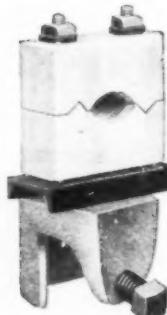
A NATIONAL DISTRIBUTING ORGANIZATION WITH 79 BRANCHES

# LATROBE



No. 450 Wood Pin & Bolt

D.G. DP Glass Insulator attached to No. 403 Insulator Support.



No. 403 Insulator Support

No. 3½ B & D Cleat attached to No. 403 Insulator Support with No. 445 Cleat attachment.



Keystone Fish Wire

Made of finest grade flat steel wire properly tempered. Ten sizes. Packed 100, 150 and 200 foot coils. Other lengths if required.



Check your stock and let us know your requirements. We will make every effort to ship when wanted.

**FULLMAN MANUFACTURING CO.**  
LATROBE . . . PENNSYLVANIA

## FLOOR BOXES

and

## WIRING SPECIALTIES

Production problems will increase as the war progresses. Labor will be harder to find. Time-saving will be in order.

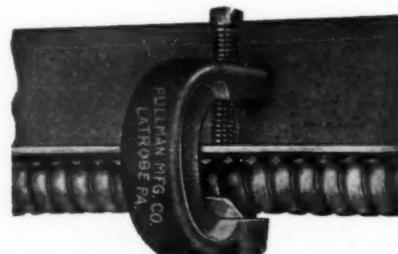
Latrobe Floor Boxes and Wiring Specialties for industrial, commercial and residential jobs fit into the situation perfectly. Their ease of installation represents an economy of time which in many instances may save the production schedule from slipping.

Use Latrobe products with complete confidence for both temporary and permanent jobs.



No. 252-R Floor Box

Shown with No. 206 and No. 207 Nozzles. Brass flange frames are securely fastened to iron adjusting frames to prevent floors from chipping when cover plates are removed.



No. 480 "Bull Dog" Armored Cable Support

A strong lightweight clamp for hanging armored cable to steelwork. Cadmium plated with case hardened cup point set screw. Convenient for temporary or permanent jobs.

## Estimating

[FROM PAGE 42]

In commercial work, the lighting load is frequently much larger than the power load and in industry the lighting loads are constantly increasing—standards are climbing upward.

And so, it may happen that the larger portion of the job you are called to figure will consist of lighting. Let's review a few simple suggestions on taking-off lighting branch circuit systems. They are:

1. Take extreme care in counting and listing lighting outlets. These quantities will be used in checking all other branch lighting materials.

2. List all quantities, after the take-off has been completed, on the pricing sheet in the following order:

- (a) Outlet boxes
- (b) Conduit
- (c) Wire
- (d) Switches, receptacles and similar wiring devices

- (e) Box hangers, connectors and sundry materials

3. Check each item on the take-off sheet to see that it and all pertinent materials have been listed on the pricing sheet.

4. Check specification and plan notes pertaining to the lighting branch circuits.

5. Check pricing, extensions, decimal points and additions.

6. Use the following methods to the consistency of the quantities listed:

- (a) Sum up the total number of lighting outlets of all kinds.

- (b) Divide the total lineal feet of conduit by the total number of outlets to see if the amount per outlet is reasonable.

$$\text{Conduit per outlet} = \frac{\text{Total feet of conduit}}{\text{Total No. of outlets}}$$

- (c) Divide the total lineal feet of wire



INDUSTRY PROBLEMS occupy spare moments of Tennessee electrical contractors (L to R) Herbert Haile, Chattanooga; Arthur J. Thompson, Memphis; and Paul W. Curtis, Chattanooga, at the recent state contractors convention at Chattanooga.



## Lift the Film of "NIGHT BLINDNESS" from Industry!

**In war plants all over the land MILLER Continuous Wireway Fluorescent Lighting System has raised the sights on production by lifting the level of illumination to 50 foot candles, 100 or higher . . .**

99,000 out of 100,000 war plants have inadequate lighting for fast, precision production . . . according to the National Better Light Better Sight Bureau.

Inability to see clearly and sharply at all times can be just as tragic a liability to war workers as "Night Blindness" is to fighting pilots.

Today nothing less than ideal "seeing" conditions in your customers' plants, 24 hours around the clock, should satisfy you.

MILLER 50 Foot CANDLER and 100

FOOT CANDLER will put 50 foot candles, 100 or better of man-made daylight on every working surface in their plants. MILLER TROFFERS will duplicate that performance in their plant offices and drafting rooms.

They will accomplish this at an economy and speed of installation that

will pleasantly surprise even you.

The sooner you get a MILLER engineer at their plants to give them an analysis of *exactly* the working illumination they need today, the sooner they can get busy and beat their best war production promise. *Write or wire today.* (Representatives in principal cities.)

BUY U. S. WAR BONDS



**MILLER**

**50 FOOT CANDLER**  
**100 FOOT CANDLER**  
**MILLER TROFFERS**  
*Continuous Wireway Fluorescent  
Lighting Systems*



**THE MILLER COMPANY**  
 MERIDEN, CONN.  
*Pioneers in Good Lighting Since 1844*

**\* MILLER offers a complete line of**  
 filament and fluorescent lighting equipment.



# Master Sergeant AND Electrician's Mate

## KNOW KLEINS

**A**ny man who works with tools knows how much his skill depends on their quality—work is better done—performed with greater speed when the pliers are Klein's.

Today Klein pliers, belts and straps, climbers, grips, splicing clamps, wrenches and knives are helping fight America's battle both with the armed forces and with the army of workers behind the lines, who are keeping power, communications and transportation operating at peak efficiency.

### ASK YOUR SUPPLIER

#### Foreign Distributor:

International Standard Electric Corp., New York

**Mathias KLEIN & Sons**  
Established 1857  
1200 BELMONT AVENUE CHICAGO



## Estimating

[FROM PAGE 44]

by the total lineal feet of conduit. By the time the estimator has taken off the conduit and wire, he should have a good idea of what the ratio should be.

(d) Check the total number of switches, receptacles and similar wiring devices against the total number of outlet boxes requiring the same.

(e) Check the listing of sundry materials for fastenings, box supports, lock-nuts and bushings, fittings, fixture studs, plaster rings, and other miscellaneous accessories.

(f) Check the estimated cost per outlet as per following example:

Total outlets—450  
Total material cost—\$972.00  
Total labor cost—\$1,588.00

Material cost per outlet

$$= \frac{972.00}{450} = \$2.16$$

Labor cost per outlet

$$= \frac{1588.00}{450} = \$3.53$$

Total cost per outlet \$5.69

If at all possible, it is well to put this check on the bottom of the pricing sheet. Don't leave check figures, calculations or notes on scraps of paper or envelopes. Place them on the estimate sheets where they will always be handy for quick reference.

(g) Check the listing and extensions as outlined under "CHECKING ESTIMATES" covered in the second item of this series on page 74 of the April, 1942 issue of *Electrical Contracting*.

Lighting fixtures should be taken off and listed separately, just as other equipment. This subject will be discussed in the next item of this series.



**WARTIME RESTRICTIONS** on appliances and defense house wiring are discussed by (L. to R.) Bill Wilcox, dealer representative of Public Service of Northern Illinois and Ted Osberg, president, Riverside Electric Co., contracting firm of Riverside, Ill.

# **MORE Ideas You Can Use**

**To Help Your Customers  
Get LONGER LIFE From  
Portable Cords and Cables**



**PROTECT** cords from being run over by heavy moving equipment, dragged around sharp corners, yanked to remove kinks. While HAZACORD rubber sheathed cords and cables are built to stand up under tough service, unnecessary abuse unduly shortens their life.

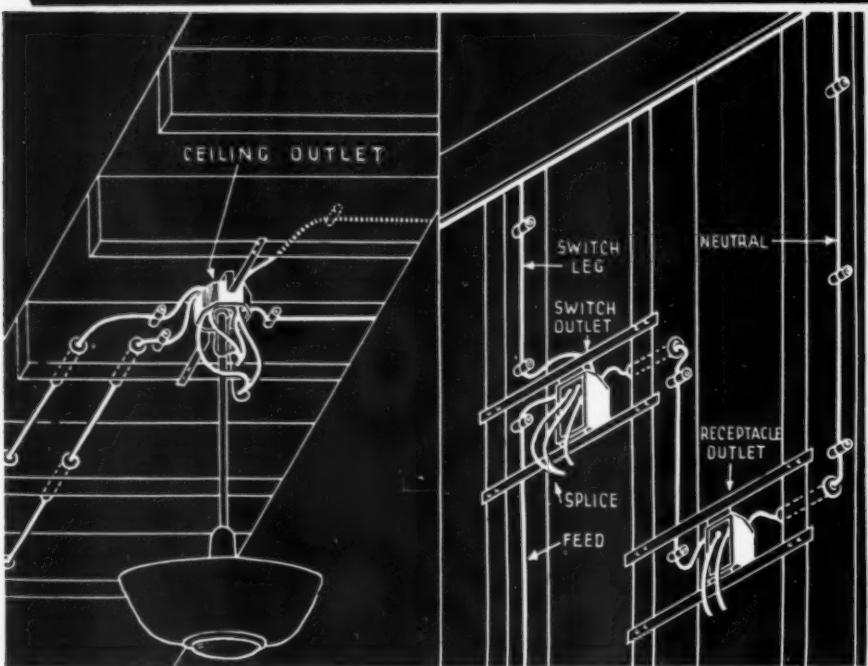
**KEEP** your cords and cable — as much as is practically possible — away from high voltage equipment and sparking motors. Such machines generate ozone which attacks rubber and hastens its deterioration.

**DON'T** run cord and cables over small diameter pulleys or drums. Continued bending and flexing around short radius breaks the conductors. Use large diameter pulleys and get longer service from cords.

**HAZARD INSULATED WIRE WORKS**  
DIVISION OF THE OKONITE COMPANY  
Works: Wilkes-Barre, Pennsylvania  
Offices in Principal Cities

 **HAZARD**  
**Insulated Wires and Cables**

# PORCELAIN *Saves*



VITAL MATERIALS AND  
RUBBER

ASSURES SAFETY AND  
ADEQUACY

OUTLASTS THE BUILDING

SAVES COSTS AT THE  
START AND DURING THE  
YEARS

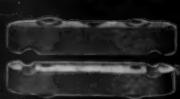
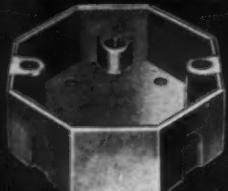
## MODERN PORCELAIN PROTECTED WIRING SYSTEMS . . . *are adaptable to practically all wiring plans and layouts*

**I**N Porcelain Protected Wiring, as in other modern wiring procedure, number 12 wire must be used as a minimum for appliance circuits to kitchen, dining room and laundry. Number 12 wire is also recommended as a minimum for all circuits feeding convenience receptacles. Conductor sizes for other circuits and feeders, will depend upon the load they are to carry and the permissible voltage loss. A generous allowance for future load increases should be made so that the occupancy may retain its electrical modernity over a greater period of time.

- The Porcelain Protected System is the only wiring method that provides full circuit insulation and isolation without being dependent upon conductor insulation. Conductors could be bare, although it is not recommended, because all conductors are supported in free air on porcelain. Also, because all conductors are supported in free air, the entire system operates at a lower temperature, permitting greater carrying capacities for all conductor sizes as compared to other wiring methods. This differential in carrying capacity starts at about 33% on No. 14 wire and increases to more than 100% on the larger size conductors.

At points of control and utilization, porcelain outlet boxes and cover devices eliminate the objections found in boxes of conducting materials. They are shock proof, short proof, rust proof, and corrosion proof. Standard knockouts and standard spacing in porcelain outlet boxes take all modern fixtures, switches, convenience outlet and cover devices. No clamps, connectors, or special adapters required.

## MODERN PORCELAIN PROTECTED WIRING SYSTEMS



★ ILLINOIS ELECTRIC PORCELAIN CO.  
Macomb, Ill.

★ KNOX PORCELAIN CORPORATION  
Knoxville, Tennessee

★ PORCELAIN PRODUCTS, INCORPORATED  
Findlay, Ohio

# Industrial Electrification

Engineering • Installation • Maintenance

## SAFETY LANES

**GROUNDING** the wiring circuits in industrial plants acts as a double safety check; faults in electrical circuits are given a low resistance path to ground to quickly operate protective cutouts or circuit breakers and the worker is protected against dangerous shock hazards because the voltage to ground of all parts of the wiring system is limited.

And in both of these safety checks the grounding can be effective only if it is properly and adequately installed according to good engineering practice with a full understanding of its purpose.

It is not uncommon even among experienced electrical men to find some confusion over the distinctions between grounding conductors and grounded neutral conductors and about the rules pertaining to circuit grounding and the grounding of conduit and equipment enclosures.

In the accompanying article many of these points are cleared up with practical kinks on the methods to use and the pitfalls to avoid. With many plants quickly changing wiring systems for new processes and new machines, the code rules on grounding deserve careful study.

### Previous articles covered—

Eliminating Causes of Severe Service Conditions  
Providing Adequate Capacity for Increased Demand  
Electrifying Operations to Reduce Unit Costs  
Safety Protection for Electrical Operations  
Increasing Flexibility of Electrical Service  
Electrical AIDS to Automatic Control  
Electrical Ways to Reduce Waste  
How to Save Power  
Protection Against Sabotage  
Improving Working Conditions  
Electrifying for Continuous Operation  
Electrified Plant Housekeeping  
Electrical Problems Under 168 Hour Schedules  
Electrical AIDS to Plant Conversion  
Electrical AIDS to Quality Control  
Electrical AIDS for Green Help  
Codes in Wartime  
Grounding for Safety (this issue)

### Future articles will discuss—

Welding in Industry  
Preparing for blackout operations  
Operating with minimum electrical replacements  
Limiting power peaks  
Restoring electrical service  
Wiring for quick changes  
Salvaging electrical equipment

**T**HIS article discusses the ways and means of grounding, starting at the transformer, and following through the service to the ultimate utilization equipment.

The National Electrical Codes allow for the solid connection of primary arrester grounding leads to secondary neutrals. By thus shunting arresters across transformers, winding failures should be prevented, also the flow of damaging power current into secondary wiring systems.

Low-voltage protectors are available for conduit mounting at meters. The grounding connection of such arresters may be made to the neutral (NEC Section 2631), thus protecting wiring and equipment.

The method of grounding equipment by its connection to the white wire will soon be further approved, provided the NEC accepts a recent proposal. The present rules allow metering equipment to be so grounded (Section 2382a). The new proposal would permit the grounding of meter housings, underground service boxes, gutters and the like by their connection to the grounded service conductor on the supply side of the service disconnecting means.

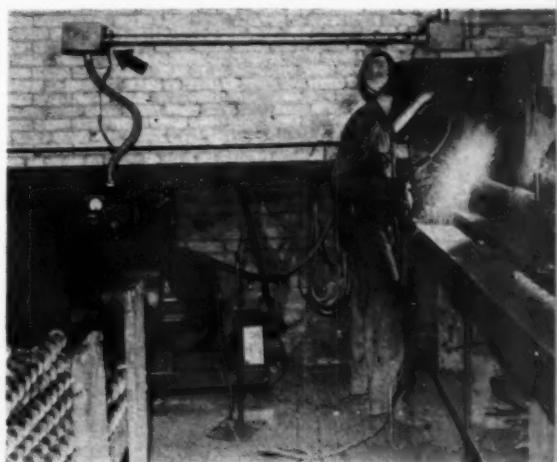
### Grounding at the Service

The service grounding connection is important to any a.c. system, and is best accomplished by the connection of the service neutral along with the grounding wire directly to the switch case. Also, by bonding the service raceway to this junction point. Then, on a service short to ground, there will be at least two paths over which current may readily return to the transformer to operate the primary fuse.

To illustrate, on a housing job, the service and grounding cables were brought to an outdoor meter box, the service continuing to the indoor switch cabinet wherein the "groundable" screw had not been tightened, leaving the neutral plate insulated. Any ground trouble in that box would have forced current over the armored cable branches to whatever accidental grounds existed. Such accidental high-resistance contacts result in "hot-armor" fires. With the "groundable" screw driven home, ground current will mostly flow back over the neutral.

Multiple ground connection are prohibited (Section 2523) because current would flow over water pipes paralleled with neutrals. However, master services (Section 2524), may be grounded in each building, thus avoiding the long high-resistance path through the earth.

*ARC WELDING set such as this 300 amp. portable unit should have its frame grounded as is done here, through the conduit, to protect this worker in plant of The Iron Fireman Mfg. Co.*





**CONSTANTLY exposed equipment such as modern electrically driven conveyors should be grounded for protection of workers.**

back to the main service. By picking up current on the lower-resistance neutral, troubles are cleared by faster fuse blowing.

Not all services originate at the main switch. The popular plan of supplying lighting by isolated transformers is bringing with it the failure to provide the required secondary grounds (Section 2526).

Temporary work requires special attention to be certain that grounding is not overlooked, as on a rush 460-volt job, where the entrance switch was mounted right over the sprinkler entrance without having a grounding connection. To close that ungrounded switch, one had to stand right on those sprinkler pipes—an awful condition.

#### Conductors

Recent years have brought the development from separate grounding conductors to the use of one common grounding conductor for circuit, service equipment and interior equipment i.e., for everything except lightning rods (Sections 2553 and 2591). A common conductor must be of corrosion-resistant material, consequently pipe alone may not be used as such (page 77 NEC). Busbar is approved.

Conduit, tubing, etc., are permitted for grounding equipment. It should be noted that such conductors must be installed in accordance with NEC rules governing these wiring methods. On the other hand, if a wire is used, it may be bare or insulated, run open or concealed. If smaller than No. 6, it must be in conduit, tubing or armor. No. 6 may be rigidly fastened to building surfaces where not exposed to injury. For No. 4 or larger, the Code does not require protection unless exposed to severe mechanical injury.

Grounding conductor sizes range from

No. 18 for portables to 3/0 and 2-inch tubing. The old rule of one-fifth the neutral no longer applies. See tables on page 77 N. E. Code. Where a buried electrode is employed, a No. 6 conductor is sufficient (Section 2594).

An excellent way to protect a grounding conductor and save material too is to run it in the same conduit as the circuit conductors (Section 2598).

#### Bonding

A conduit may possibly carry as much current as the circuit fuse, therefore bonds are required around contacts of uncertain resistance. The current which may flow over a service cable or conduit is limited only by the primary fuse.

Bonding bushings are common and work out well in the smaller sizes. For larger pipes attached to boxes without threaded hubs, ground clamps and cable shunts can be used.

Double locknuts are required for circuits over 150 volts. Where used on enameled boxes, surfaces must be cleaned, and this in turn may start rusting in damp locations. Bonding bushings overcome this objection.

Double locknuts are not approved for service work where threaded conduit, threadless EMT fittings, bonding bushings, or approved fittings like wedge lugs are required.

In hazardous locations threaded conduit fittings do not, of course, require additional bonds (Section 2576).

The use of wedge locknuts with tubing fittings assure positive ground continuity.

#### Electrodes

The increased wartime use of cement pipe is doing away with our best ground, so we may have to turn from the water service to other electrodes (Section 2582).

Sprinkler systems might be OK. They are of large capacity, and unmetered, which is an advantage.

Copper rods being unobtainable, iron pipes may be driven. They should be cleaned of all enamel and grease. Galvanized pipes are best; however, rusting in place has no effect in increasing the resistance. Two or more pipes should be driven when one exceeds 25 ohms (Section 2584), or each electrode can be salted. Cinders and brine wastes have the lowest soil resistance, next clay and loam, and lastly gravel. Space rods or pipes at least six feet apart.

Lead pipes and gas piping should be avoided, because the first might be melted and with the latter, sparks have ignited gases.

The common service ground should be carried back to the street side of the

water meter, whereas equipment grounds may be made to a convenient pipe. There is this difference, that the equipment normally carries no current, while the common ground carries some small current because it parallels the neutral. That's why it is dangerous to open a circuit ground. A jumper should always be used.

#### Clamps

The 1940 NEC ruled that solderless connectors only would be approved for grounding (Sections 2613 and 2614). Recently, however, Underwriters announced because of shortages this ruling would not have to be met on equipment. Clamps should be of the same metal as the pipe to which they are attached to avoid corrosion.

Copper strap clamps are permissible for equipment and raceway connections, but should be protected against mechanical injury (Section 2616).

#### Conductor Enclosures

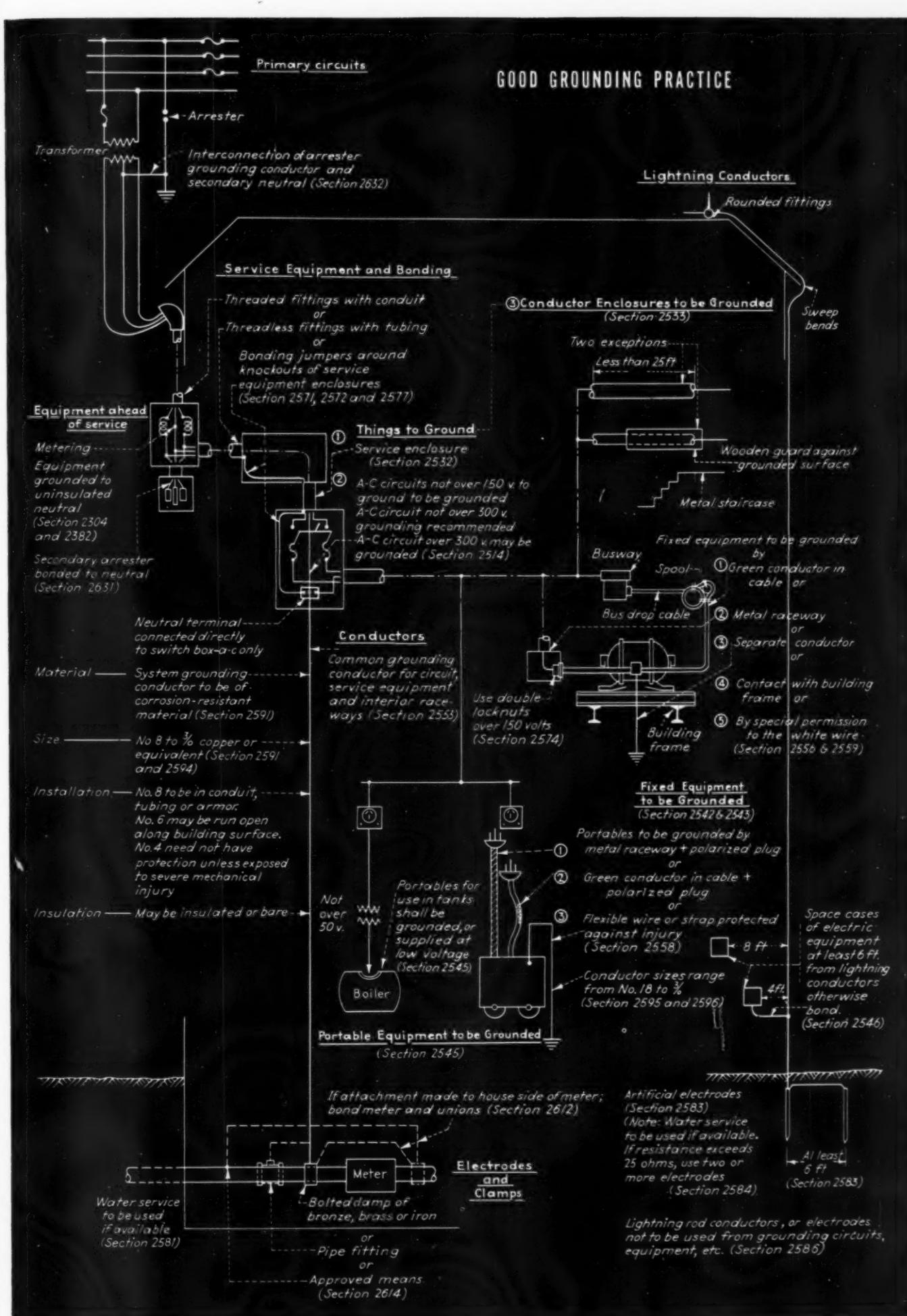
A recent radical NEC change requires that distribution cabinets be grounded to neutrals where the new uninsulated neutral cable is used (interim revision No. 43, Section 3372). And, a more recent proposal would recognize the now common practice of grounding ranges to the neutral where not in contact with other grounded structures.

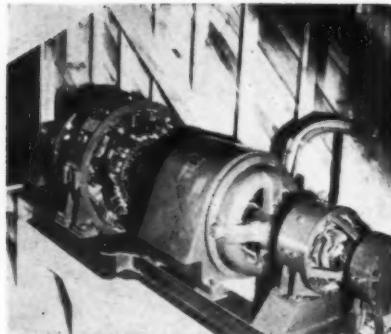
Wartime open wiring will bring short sections of protective conduits to be grounded, unless wooden boxing is used for protection.

In a mid-western plant where feeders were run in fibre conduits, thus break-



**GROUNDING of service conductor on the supply side of the disconnecting switch is advocated. Here is a coal mine operator at disconnecting service switch which controls three 37½ kva. transformers**





**UNGROUNDED FIXED** machines are dangerous if proper precautions have not been taken. Equipment such as this M-G set may be considered grounded when secured in contact with a grounded metal building frame. (G.E. photo)

ing the continuity of the raceway ground, the panelboards were grounded to the building columns, which in turn were bonded to the sprinkler system.

#### Fixed Equipment

Grounding of fixtures is important, especially in damp places and where within reach of grounded surfaces like pipes and building frames. Of course, insulation is an alternative as for example, the porcelain lampholder (Section 4106).

Metal boxes for switches, receptacles and the like located over plumbing should be grounded; if used with a metal-clad wiring system, they must be grounded in any event.

Whereas the common method of grounding equipment has been through conduits, non-metallic covered cables are being increasingly used to supply machinery from busways. One bus-drop cable being advertised has three green-braided grounding wires to presumably ground as many motors (Section 2556). If green-braided conductors are not available for identification, at least paint is obtainable, and should be used to guard against the danger of energizing a framework by the connection of a grounding wire to a live bus.

Some motors may not need separate grounding connections, for instance, a direct-connected pump on a water system. Fixed equipment has dangerous possibilities, but portables even more so, because there the connections are subject to greater disturbance.

Portable electrical equipment is being subjected to hard usage and abuse by the green help turning out our war goods, and these tools are going to require more care in order to maintain production and guard the lives of these workers. The fact of having ex-hotel clerks of little mechanical ability boss assembly lines throws correspondingly greater responsibility on the mainte-

nance crew to keep tools in safe electrical condition.

Perhaps the greatest hazard—it has caused many fatal accidents—is in the use of handlamps inside boilers, where the combination of excess perspiration and intimate body contact with grounded surfaces sets up fatal conditions, if leaky appliances are used. The Code in 1940 set up rules to safeguard such workers (Section 2545), either by grounding or by the use of low-voltage tools, under 50 volts.

In contrast, higher utilization voltages are being installed to increase the capacity of given circuits, sometimes against the dictates of safety. A foundry was changed from 208 to 480 volts distribution to avoid copper increase, but the danger in the use of portables was increased. The portable screening machines would have been much safer at 208 volts, or 120 volts to ground, than changed over as they were for the higher ungrounded voltage system. The Code (Section 4437) specifically requires the grounding of such portable motors operating at more than 150 volts to ground.

Right now, it is all too common to see the grounding terminals of 3-conductor cables left unconnected at receptacles, especially with fluorescent lamp installations. Much more dangerous are portable welders, which the handyman often hooks up without regard to frame grounding. Some manufacturers cooperate to the extent of furnishing special primary plug receptacles with their arc welding sets to fit the three-prong polarized plug provided on the primary cord. Underwriters' Laboratories' standards call for not over 100 volts as the open-circuit secondary potential of arc-welding machines, plus the strong recommendation that this potential does not exceed 40 volts.

#### Lightning Protection

Lightning is a destructive force against which structures should be protected, generally by simple aerial and electrode systems which pick up and conduct the lightning surges to ground over special low-impedance circuits.

Low resistance of the grounding system is important. The Code calls for not over 25 ohms for electrodes. Solderless connectors should be used at conductors and electrodes. Corrosion-resistant conductors with sweep bends and fittings having round sweeping curves are generally installed to carry the discharges harmlessly to ground without danger of arcing discharges at offsets and turns.

Lightning conductors should be kept away from other equipment (Section 2546) to prevent flashovers, and possible

resulting fires, which might occur to grounded objects, when the potential of the lightning system is raised far above ground level by lightning discharges. However, if separation cannot be maintained, arc-over can be prevented by bonding the system and equipment in question.

For detailed guidance, one might well use the NFPA Code for Protection Against Lightning.

When an accidental ground occurs on a grounded circuit, it is recognized that service may be continued by the removal of the protective ground. This, however, should be regarded as nothing but a temporary expedient and such a condition must never be allowed to exist because of the ensuing danger to life and property.

Protective grounding of lines taken out of service for repairs might, in some cases, be especially worthwhile for the protection of workmen. The disadvantage is that this protective scheme needs careful supervision to avoid the disastrous energizing of temporarily-grounded lines.

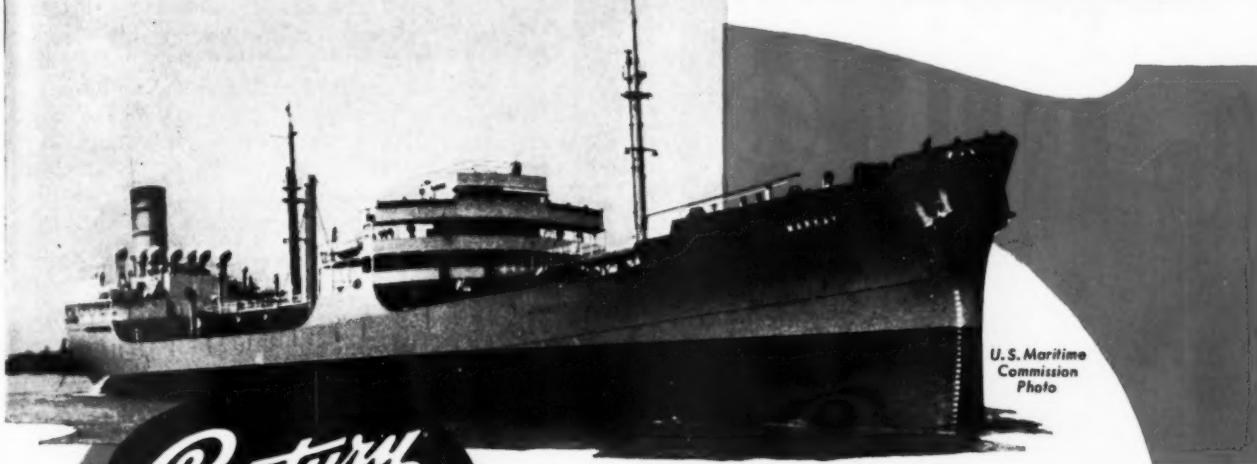
Autotransformer installations need to be made with care to be sure that the white wire is carried through to both sides of the transformer. Neglect to do so can result in accidents, as where recently an autotransformer rectifier had the common a.c. d.c. conductor connected to the live a.c. conductor, resulting in the energizing of an auto frame at full line voltage.

Grounding is insurance. You guard against a loss which you hope will never materialize. Its ounce of prevention is better than a pound of cure.



**EQUIPMENT** such as this refrigerating fan cooler unit require grounding especially in damp places and within reach of plumbing. A dangerous condition would arise if equipment was ungrounded and worker came in contact with the cooling pipes.

## *American Production is Speeding the Day of Victory- And Century Electric Motors Aid Production*



**Century**  
**MOTORS**

# Built According to Many "Sea Going" Specifications

Century Motors are playing their part at sea as well as ashore in various climates, from the wintry seas of Iceland to the humid climate of the South Pacific Ocean.

**Century Motors for such vital uses are available:**

1. For indoor and outdoor installations
  2. With drip proof, splash proof; enclosed, enclosed fan cooled, explosion proof, weatherproof protection
  3. Alternating and direct current
  4. And as motor driven AC and DC generator sets—for normal low, standard, and high voltages— $1/20$  to 400 horsepower, 50 watts to 200 kilowatts.

This wide range of types and sizes of Century Motors and Generators makes it possible for the engineer to easily select the right motor or generator to exactly meet various application requirements and surrounding conditions.

The dependable performance for which Century Motors are famous is serving American Wartime industry, too, in thousands of industrial applications. Your nearest Century Sales Engineer will gladly add his extensive experience to help you select the right electric motor. He is on call every day of the year.

## **CENTURY ELECTRIC CO.**

**1806 Pine Street**      **St. Louis, Missouri**

**Offices and Stock Points in Principal Cities**

*One of the Largest Exclusive Motor and Generator Manufacturers in the World.*

# BUNTING



The extraordinary wear resistance and the exceptional anti-frictional qualities of Bunting Bronze Bearings are providing better performance and longer life for millions of motors now carrying heavier loads than ever before. Ample stocks of these bearings completely finished, ready for immediate assembly in all popular makes and sizes of motors, simplify your maintenance problem. Ask your wholesaler. Write for catalog . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

## Electric Motor Bearings

*For Better Service -*

INSTALL **TRICO** REG. U.S. PAT. OFF.

RENEWABLE FUSES With the famous Powder-Packed Element

KLIPLOK CLAMPS Lock fuses and clips together

KANTARK FUSES With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES The color tells the size

FUSE PULLERS Pull and replace fuses safely

OILERS Glass and Unbreakable types for every application. Stops guesswork - bearing failures - waste - idle machinery, etc.

WRITE FOR FOLDER No. 300

TRICO FUSE MFG. CO., Milwaukee, Wis.  
In Canada: IRVING SMITH LIMITED, Montreal

\*\* Hold Up to 5 TONS Safely with **PAINE** Pull-Out-Proof ANCHORS LEAD EXPANSION TYPE

Fig. 910 Fig. 900

- Save time, labor and "callbacks"
- Simply place in hole, tap with setting tool and tighten
- Precision threaded, rust and vibration resistant
- Assure a permanent workman-like job
- Fig. 900 available in 9 standard diameters from 6-32 to  $\frac{1}{2}$ ". Fig. 910 in  $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ " diams. in standard lengths.

Ask your Supplier TODAY and Write for Catalog.  
THE PAINE CO. 2961 Carroll Ave., Chicago III.  
Offices in Principal Cities

**PAINE**  
FASTENING and HANGING DEVICES

## Protection For Little Used Motors

Today, there are few instances where installed motors are used as sparingly as once in every five years. But they do exist, and protection is needed to keep the motor free from deterioration and corrosion.

Baltimore's Bureau of Water Supply has such a motor in connection with their water tunnel profile trap holding 15 million gallons of water. The motor



COMPLETE PROTECTION against faulty operation on this huge motor is provided by heating the coils of the stator and armature windings to avoid moisture condensation which causes deterioration and corrosion.

provides driving power when complete dewatering is necessary. While this is only once every five years, unfailing service must always be available. In order to keep it in tip top condition, a set of strip heating elements are located within the air tight housing near the stator and armature windings. Thermostatic controls turn on the heater "juice" when the temperature hits below 40° F.

Operation of the 1,250 hp. motor does not add a peak to the load as the motor is supplied from a transformer bank which also serves the filtration plant and a nearby pumping station. Any shutdown requiring dewatering would involve stoppage of the latter two plants thus cutting off more load than the motor adds to the line.

## Wire Drawing Improved by Variable-Voltage

The George W. Prentiss Company of Holyoke, Mass., has developed a wire-drawing bench using variable-voltage motors for the operation of pulling wire. The standard practice is to pull wire through a succession of dies. Between each die is a motor-driven drum, around which the wire is snubbed. To run smoothly the motors must always maintain the same ratios of speed, from the threading at low speed to running at high speed. Heretofore, the motors were supplied from a constant voltage

in times of maximum production,  
including normal factors of safety,  
estimated motor load of 12 hp.

Let's play safe and order a  
15 hp motor for this job

Bob S

(15)

## GENERAL ELECTRIC asks:

**"Will you help save 25% in critical materials  
by modifying your peacetime motor policy?"**

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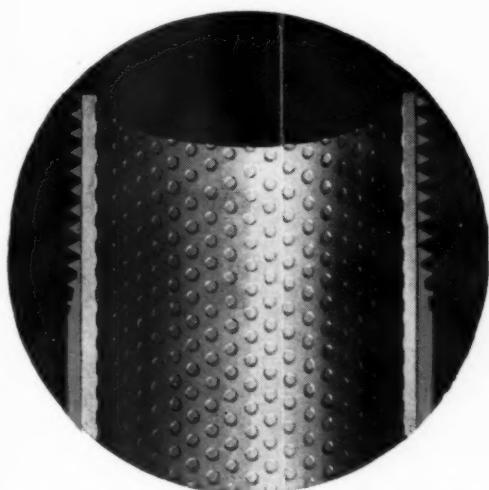
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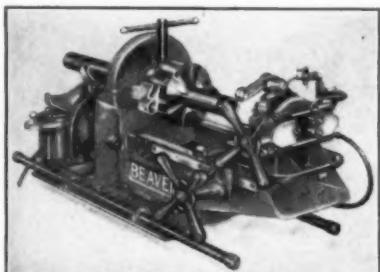


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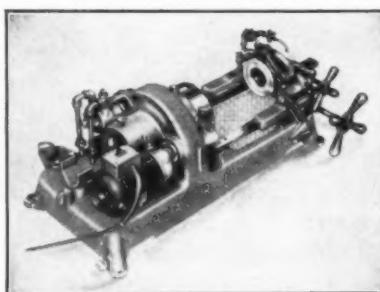
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Write for Bulletin A



**Beaver Model-B**

A light-weight utility Pipe and Bolt Machine combining many features of Model-A with the easy portability of Model-C. Range  $\frac{1}{8}$  to 2-inch up to 8-inch with drive shaft and geared tools. Bolts up to  $1\frac{1}{2}$ -inch. Weight 280 lbs.

Write for Bulletin B



**Models C-1 and C-2**

A STURDY LITTLE POWER UNIT Converts hand pipe tools into power tools from  $\frac{1}{4}$  to 8-inch. Threads 8-inch in 6 minutes. Threads bolts up to  $1\frac{1}{2}$ -inch. Two men can work at the same time without interference. Weight 150 lbs.

Write for Bulletin C

Write for new Tool and Machine Catalogue—Just off the press

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 842 Deen Ave., Warren, O.

bus, and the speeds controlled by field rheostats positioned mechanically by the wire itself.

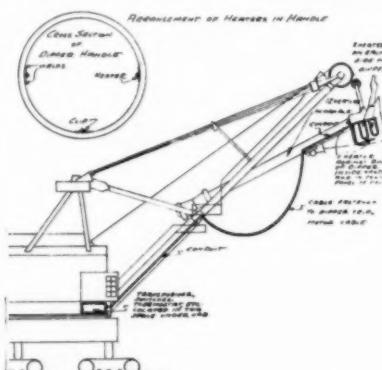
The new method using variable voltage motors does away with mechanical connections and rheostats. Once proper field adjustments are made to each motor, they can be simultaneously started from standstill, operate at low speeds for threading, and on up to full running speeds simply by raising the supply voltage. The motors through all of this maintain their speed ratios so exactly that tension in the wire is constant on each side of each die.

The result is greater mechanical and operating simplicity. Operating costs are lowered because breaks occur less frequently in the wire and starts are smoother.

**Heaters Solve**  
**Cold Weather Problem**

As a result of chilled conditions during winter operations the dipper handle of a big stripping shovel, at Truax-Traer Coal Company of Fiatt, Ill., sometimes snapped. Each breakdown caused expensive idleness together with a large repair bill.

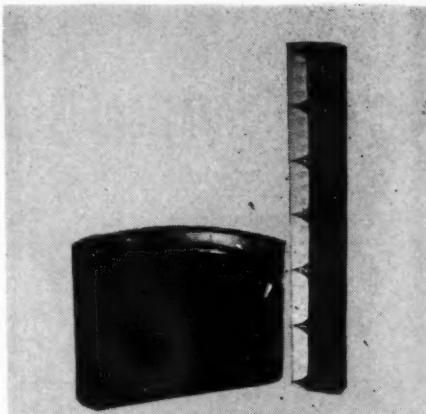
This cold-weather damage has been largely averted by the installation of



**SCHEMATIC VIEW** showing heaters and wiring arrangement in the stripping shovel of the Truax-Traer Coal Company.

twelve 2 kw. calrod heating units around the inner surface of the dipper handle. Heaters were also installed on the dipper itself to thaw out accumulated mud which froze to the sides and bottom of the dipper. The mud sometimes reduced the payload of the dipper as much as 50 per cent. Large fires and an hour shut-down were necessary to thaw out the muck.

To solve this problem hotplates heated by calrod units were welded on each side of the dipper, and on center panel of the door. Another unit was formed in a circle around the manhole entrance to the dipper handle. To close the circuit when the temperature went down,



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a thermostat was set at 25° F., since no trouble was experienced above that figure.

To keep the cab at a comfortable temperature thus protecting the operator, two 3 kw. convection heaters are mounted in the control cab of the shovel.

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A group of 60—15 kva. Westinghouse capacitors installed in a Southern ore refinery sliced \$6,900 off the plant's power bill during the first year's operation. Power factor was raised from 78 to 92 per cent.

Squirrel-cage induction motors, for the most part, are used to drive the various equipment. Improper loading of these motors, due to nature of product handled, averaged 66 per cent of full load rating, resulted in low power factor and heavy lagging currents.

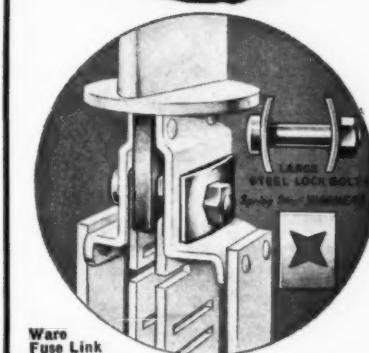
Realizing that raising the plant power factor would increase the kwh. obtainable at a lower energy rate, and at the same time reduce the kva. demand, the



**CAPACITORS**—Two of the thirteen banks of capacitors total 900 kva. capacity installed in a Southern ore refinery. They are mounted on top of the metal clad switchgear, each bank above its corresponding feeder circuit-breaker panel.

company management decided to install capacitors.

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# Reader's QUIZ

**QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.**

## FLUORESCENT CORKSCREW

**QUESTION 57.** In a 40-watt fluorescent lamp on 220-volt, 60 cycle circuit, a band of light revolves corkscrew fashion in the tube. When reversed end for end this is cleared up until the lamp is turned off and relighted. What is the cause and how can I cure this phenomenon?—S. C.

**A.** TO QUESTION 57. There are several reasons which may cause the corkscrew action in your fluorescent lamp. From your description I would judge your trouble lies in a defective starter which does not allow sufficient time for pre-heating the filament. When you reversed the tube it functioned normally because it was still warm and the starter did not require as much time as starting a cold tube. After the lamp was shut down and allowed to cool before starting again the same corkscrew effect returned. Other causes of this spiral effect are low voltage and a cold draft on all or part of the tube. Occasionally a new tube will flutter but will usually cease after a few hours burning or seasoning.—J.J.L.

**A.** TO QUESTION 57. This phenomenon, sometimes called "snaking" may be caused by the following: (a) A new lamp. This should work itself out. (b) Improper electrode temperature, due to defective starter. (c) If lamp operates from two-lamp auxiliary a starting compensator should be in the leading circuit. (d) Improper auxiliary, due to design or selection. (e) Starting voltage may be too high. (f) Defective lamp.—M.F.

**A.** TO QUESTION 57. It may be just growing pains of the flu-

rescent lamp—not just perfect as yet. New lamps are subject to this trouble and after operating 100 hours or so lamps may clear.

We have tried several cures like turning lamp end for end, turning lamp half over, and lastly shaking lamp end ways strongly, all seemed to help some, but nothing but hours of burning gives real help. This trouble should not be confused with the flicker caused by low voltage.—W.C.

## SYNCHRONIZING GENERATORS

**QUESTION 58.** We have a 100 kva. and 150 kva. 3 phase, 480 volt 30 cycle generator, each direct connected to a 480 volt, 3 phase, 60 cycle synchronous motor. So far only one machine was run at a time to supply a 30 cycle bus but an increase in load makes it necessary to run both together. Could these generators be synchronized or would it be necessary to change the drive on one of them?—J.J.L.

**A.** TO QUESTION 58. Inasmuch as the two sets are of different size, it is quite probable that there will be some lag of voltage of one generator with respect to the other, which condition prevents the two sets from synchronizing. It will therefore be necessary to determine the magnitude and direction of this displacement and correct it so that the condition of perfect synchronism at no load is obtained. The correction can easily be calculated from voltmeter readings.

For satisfactory operation in parallel, it is necessary that there be no angular

displacement of motor shaft with respect to generator shaft, such as might occur with cushion type flexible couplings. It is assumed that the sets under discussion are provided with rigid couplings.

Bring out the leads from the two generators and connect to a test block. Start the two sets and excite the generators to deliver normal voltage (480 volts.) Determine the phase rotation of the voltage in the leads of each generator, designating the leads of set No. 1 as  $X_1, Y_1$ , and  $Z_1$  and of set No. 2 as  $X_2, Y_2$  and  $Z_2$  in accordance with XYZ rotation. Connect  $X_1$  to  $X_2$ . Measure the voltages  $Y_1$  to  $Y_2$ ,  $Z_1$  to  $Z_2$ ,  $Y_1$  to  $Z_2$  and  $Z_1$  to  $Y_2$ . The voltages  $Y_1Y_2$  and  $Z_1Z_2$  should be the same. Now reverse the polarity of the field of one of the motors, thus causing that motor to slip a pole, and again observe the voltages  $Y_1Y_2$ ,  $Z_1Z_2$ ,  $Y_1Z_2$ , and  $Z_1Y_2$ . Repeat this process of reversing the field polarity of the same motor and observing the new voltages until the original readings are observed. The original readings should be observed after slipping poles for the fourth time. Observation of the tabulated readings will show the voltages  $Y_1Y_2$  and  $Z_1Z_2$  to be a minimum in one of the four cases. The relative angular displacement of poles in electrical degrees is calculated from this minimum value by the following formula:

$$\theta = 2 \times \arcsin \left( \frac{\text{minimum voltage } Y_1 Y_2}{2 \times \text{line voltage}} \right)$$

degrees.

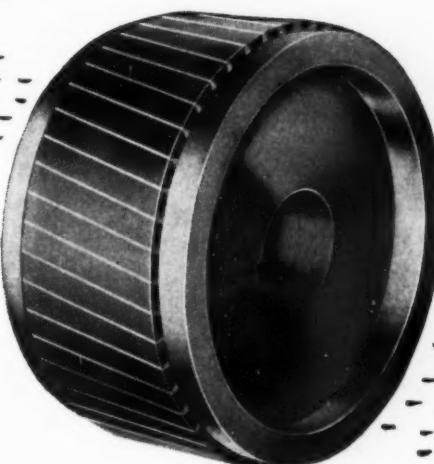
The angular displacement of motor shaft with respect to generator shaft is given by the following formula:

$$\Phi = \frac{\theta \times \text{rpm of set}}{1800} \text{ degrees.}$$

Correction for this angular displacement  $\phi$  can be made at the coupling of one of the sets in any convenient manner such as realigning the coupler bolt holes, installing offset keys, slotting new keyways, etc., the choice of method depending somewhat on the magnitude of the correction required and the facilities at hand. The direction of correction is determined by comparing the voltages  $Y_1Z_2$  and  $Z_1Y_2$  observed at the time the minimum voltage  $Y_1Y_2$  was observed. If  $Y_1Z_2$  is greater than  $Z_1Y_2$ , the generator of set No. 2 is leading the generator of set No. 1 and the coupling correction angle  $\phi$  must be made to retard generator No. 2 with respect to its driving motor. Conversely, if  $Y_1Z_2$  is less than  $Z_1Y_2$ , the coupling correction angle  $\phi$  must be made to advance generator No. 2 with respect to its driving motor.

Some variation in the ideal condition is permissible, but particular attention should be given to the magnitude of  $Y_1Y_2$  and the relation of  $Y_1Z_2$  to  $Z_1Y_2$ . It may be necessary to slip motor poles one, two or possibly three times when-

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## *Reader's* **QUIZ**

[FROM PAGE 60]

ever a set is started in order to bring the two sets into electrical alignment and therefore, it is considered very desirable to provide an interlocking relay which will prevent connecting the two sets in parallel unless correct polarity exists as shown by these voltages.—G.I.S.

**A.** TO QUESTION 58. The two generators can be synchronized, if they are constructed alike, so that when the motors are operating synchronously the generators will be exactly in phase with one another. That is the alignment of both the rotating and stationary parts of the 30-cycle end with those of the 60-cycle and must be exactly alike on both machines.

When the two machines are started from the 60-cycle end the e.m.f. of the 30-cycle generators at no-load may be in phase, or 180 electrical degrees out of phase, which is due to the two to one ratio in frequency of the motor to the generator. If these generators (without load) are 180 degrees out of phase, the simplest means of synchronizing them is to reverse the direction of the current in the field winding of one of the generators, which reverses instantaneously the polarity of the generator e.m.f. thus correcting the phase relation. The voltage of the two machines must be equalized before paralleling them.

If one unit is running and under full-load it will load the incoming (unloaded) unit by about  $12\frac{1}{2}$  degrees, which is due to the difference in load of the two units. This difference in the phase relation of the two machines is proportional to the difference in loads, thus  $12\frac{1}{2}$  degrees being about the maximum.—L.H.M.

**A.** TO QUESTION 58. The equipment you have is very simple to parallel. First, the prime movers are synchronous motors which eliminate any chance of speed variation. Since the motors are in step the 30 cycle generators can only be out of phase  $180^\circ$  or in phase. There is no other position possible.

A small reversing switch may be inserted in the field leads of either or both generators and a 430 volt lamp connected between each lead of one generator and the corresponding lead of the other generator.

The first machine is brought up to speed and connected to the bus, then the second one is started. If the lamps remain dark the generators are in phase

and the incoming one is switched onto the bus, but if the lamps light, the generators are  $180^\circ$  out of phase.

When the machines are out of phase the switch in the leads of the incoming machine is thrown in the reverse position which reverses the polarity of the machine as the lights will show by going out. The machine is then switched onto the bus.

If the lights glow slightly it is due to the loaded machine lagging. While the machine will not lose any revolutions the armature will however lag as much as 10 degrees behind the rotating field. This is a common condition and should not cause alarm. This condition will be relieved by the incoming machine.

The field of the 150 kva. machine may be adjusted so its currents are slightly leading to the current of the 100 kva. machine. This will cause the larger machine to carry more than half the load.

One precaution must be taken at the start. The couplings between motors and generators must be set so when the motors are in step the generators are also in step. If one of the generator armatures was turned a few degrees it would be impossible to synchronize them. If these machines were connected by their manufacturer they are undoubtedly set right mechanically.—C.E.S.

## **CLOSING DELTA CONNECTION**

**Q**UESTION 59. In adding a single phase transformer to close the delta on two other power transformers connected open delta, how can I find the leads to the bus when the polarity of the new transformer is unknown? The present transformers are additive polarity. Primary voltage is 7200, secondary 480 volts and all three are rated at 100 kva. capacity.—J.J.L.

**A.** TO QUESTION 59. Usually the transformer terminals are marked in such a way as to indicate the polarity of the windings. The high voltage terminals are marked  $H_1$  and  $H_2$  and the low voltage terminals  $X_1$  and  $X_2$ . When the induced voltage is from  $H_1$  to  $H_2$ , it is also from  $X_1$  and  $X_2$ .

If in the transformer the  $H_1$  and  $X_1$  are adjacent, as shown in diagram 1, the transformer is of subtractive polarity. When  $H_2$  and  $X_1$  are placed diagonally,

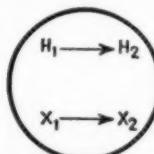


FIG. 1

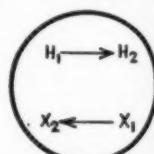
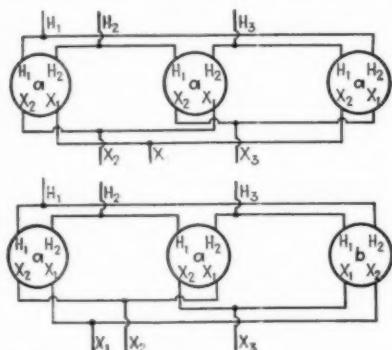


FIG. 2

as in diagram 2, the transformer is said to be of additive polarity. Facing the high voltage side of the transformer case, the  $H_1$  lead is usually brought out on the right hand side.

If the terminals are not marked, and it is necessary to check the transformer for additive or subtractive polarity, the high voltage lead on the left may be connected to the low voltage lead on the left and the transformer excited on the high voltage side. Measure the voltage between the right-hand high voltage lead and the right-hand low voltage lead. If the voltage is higher than the voltage applied on the high voltage side, the transformer is of additive polarity. If the voltage is less than the voltage on the high voltage side, the transformer is of subtractive polarity.

The usual connections are shown in the following diagrams: the letter "a"



indicates additive polarity and the letter "b" indicates subtractive polarity.—V.M.

**A.** TO QUESTION 59. Adding a third transformer to close the delta of an open delta bank should be done in the following manner. The new transformer should have, in addition to the same voltage and capacity, the same percentage of regulation and impedance or very nearly so. Small difference in any of the above will result in unsatisfactory operation. Connect the primary of the new transformer to close the delta. Then by use of a voltmeter or a piece of fuse wire close the delta on the secondary. If the fuse wire burns into or voltage is indicated on the voltmeter the polarity is wrong. Reverse the secondary connections so that the fuse wire will complete the delta without burning out.

Obviously the object of the above test is not to determine the exact polarity of the secondary terminal, but merely to indicate which of them are of the same polarity. If it is desired to determine whether the new transformer is additive or subtractive polarity, proceed as follows. Apply a convenient voltage across the primary as shown in the sketch. Then connect a voltmeter as shown. If the voltage recorded on the meter is the sum of the primary and secondary voltages the polarity is additive, whereas, if

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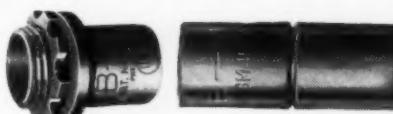


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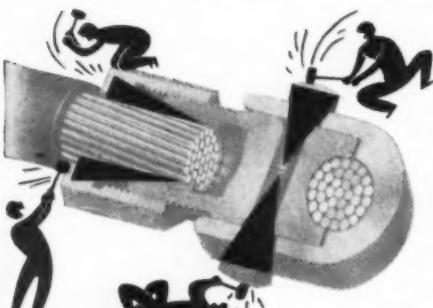
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Clifton Conduit Co.  
Jersey City, N. J.  
General Electric Co.  
Bridgeport, Conn.

The Steelduct Co.  
Youngstown, Ohio  
Enamelled Metals  
Pittsburgh, Pa.  
National Enameling & Mfg. Co.  
Pittsburgh, Pa.  
Triangle Conduit & Cable Co.  
Elmhurst, N. Y. C.

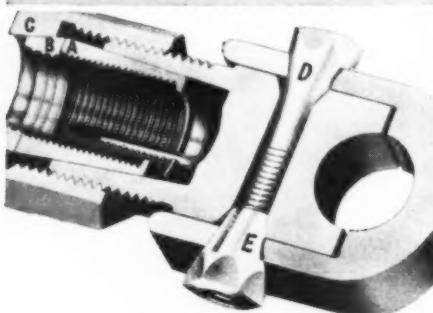
**BRIEGEL METHOD TOOL CO., Galva, Ill.**

## Did You Know

since time immemorial, the wedge has been the orthodox method of tightening and permanently joining two bodies together?



"Gorilla Grip" mechanical connectors use two types of this wedging principle.



The long-bodied, fine-threaded nut (c), the soft copper serrated sleeve (a), and the hard brass lockring (b) tapered with the same taper as the nut are used in what is known as the Terminal Unit of the Connectors.

This Terminal Unit is machined to snug and compact the wires and cables as the nut is tightened on the thread of the body. This wedging action makes a mechanically as well as electrically perfect connection.

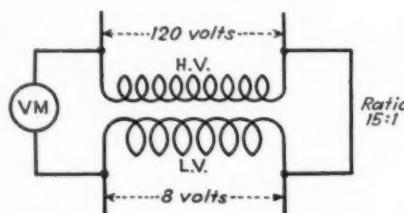
The tapered head bolt (d) and nut (e) on the yoke and body of the fittings draws these two members over the cable providing perfect electrical contact. Pressure is uniformly distributed over the full contact area and simultaneously locks the parts into position.

Write for our booklet which illustrates these mechanical principles in more detail.

**National Electric**  
PRODUCTS CORPORATION  
1000 FULTON BUILDING, PITTSBURGH, PA.

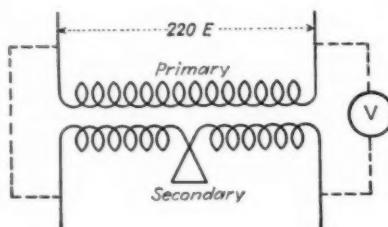
## Reader's QUIZ

[FROM PAGE 63]



the voltage recorded is the primary minus the secondary the polarity would be subtractive. Any voltage may be used for this test, up to the rated primary voltage. If 120 volts were used, the reading would show 128 volts for additive and 112 volts for subtractive polarity.—J.A.H.

**A** TO QUESTION 59. This is simply a case of finding the correct polarity of the transformer in question. Since it is a 100 kva. one it is usually additive. If the test method is not known it is done as shown in the diagram below.



Some low voltage, say 220, is applied to the primary and connections made with a voltmeter as shown. Since the transformer is a 15 to 1 ratio the secondary as connected would be about 15 volts. If the voltmeter reads about 235 volts the transformer is additive and is connected in the bank the same as the other two. However if the voltmeter reads about 205 volts then the transformer is subtractive and should be connected with the primary as usual but with the secondary leads reversed.—C.S.S.

### Can You ANSWER these QUESTIONS?

**QUESTION N2** Two motors of the same speed and horsepower but different make are connected by belt drive to the same line shaft in order that only one motor need be used for light loads if necessary. On heavy loads both motors are used but one always pulls more than its share of the load. What is the cause and remedy for this?—J.J.L.

**QUESTION 02** —Our plant is fitted throughout on 550 volt d.c. for overhead crane service. In this present emergency we are running three eight hour shifts and have had to provide lighting on the cranes. We used a series hookup of five lights. This proved to be an unfavorable and costly system to maintain because of the difficulty of locating burned out bulbs. I wonder if some other reader has had the same experience and what was done to eliminate it. What would be the proper hookup for a parallel circuit and how is the voltage controlled?—D.J.S.

**QUESTION P2** —We have a dual voltage, 3-phase induction motor that has its leads burned off in the connection box. As the leads cannot be identified it would involve considerable experimenting to get the correct combinations. Is there a standard system of identifying the leads in the position they come out through the motor frame into the connection box?—R.C.M.

**QUESTION Q2** —Is there an effective way of lighting a picking table on a coal chute? This operation is part of the coal chute. As the coal is shaken in passing over, pickers remove the pieces of slate which ride along with the coal. We have tried silver bowl, fluorescent, and HIMV lamps and several types of fixtures, but none seem to satisfy the pickers. Have any readers of this column solved this difficult lighting problem and what equipment and arrangement did they use?—O.B.C.

**QUESTION R2** —Would you recommend starting a synchronous motor, 150 hp., 150 amp., 480 volts, 900 r.p.m., 3 phase, 60 cycle, with a squirrel cage winding, across the line? The field is always closed. The machine is twenty years old and starting parts of the switch are worn out. The starting current would cause no trouble on the lines.—W.L.C.

**QUESTION S2** —We have a motor-generator set with the following nameplate data: induction motor, 440 volts, 50 cycles, 3 phase, 1450 r.p.m. 2 hp. d.c. generator, 230 volts, 1 kw., 1450 r.p.m., compound wound which is operated on 550 volts, 3 phase, 60 cycles; due to the frequency change it operates at 1750 r.p.m. and with 22 volts excess in voltage.

The generator is very slow in picking up its voltage, and if allowed to stop for a few days, it will pick up to only 100 volts; then by changing rheostat setting it builds up to over 300 volts and we have to bring it back to its original position for 230 volts. It remains this way until it is stopped again. What can I do to correct this condition?—W.G.

PLEASE SEND IN  
YOUR ANSWERS BY SEPTEMBER 1

## Keeping Arc Welders

### Welding

[FROM PAGE 19]

cable connection insulation may be responsible for unintentionally short circuiting a generator for long periods of time. This results in the flow of very heavy generator current, but because of the low generator voltage involved, does not require sufficient power input from the line to cause the motor overload relay to trip. While the motor is not damaged, the generator may be seriously overheated or burned out. The same results will follow intentional permanent short circuiting of the electrode holder on any grounded conductors.

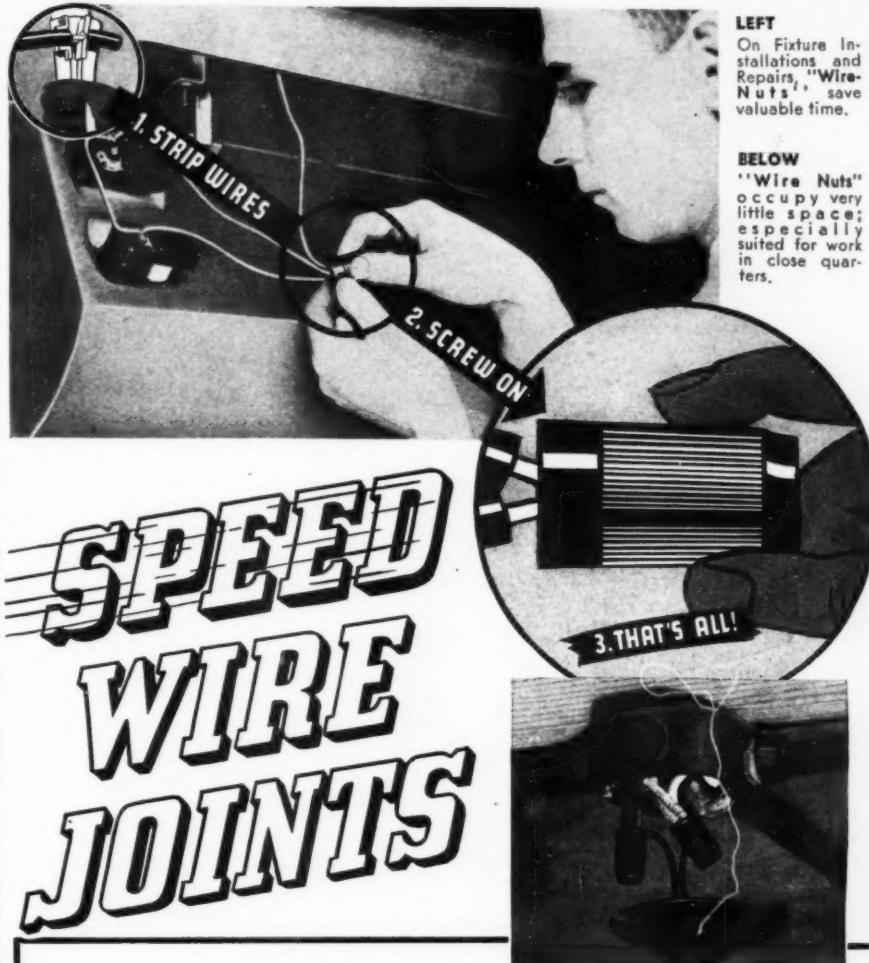
The use of improperly bonded structural steel systems or building frameworks for the welding current return circuit is undesirable. The high resistance path thus afforded the welding current may result in overheating of the welder motor, and in addition, there is always the possibility that arcing or overheating of some poor connection, possibly quite remote from the scene of operations, may start a fire.

No attempt should be made to adjust welding current output by any means other than those provided and recommended by the manufacturer of the equipment. Shifting the brushes on generators not designed for brush-shifting control will usually result in inferior welding characteristics, impaired commutation, and short brush life. Short circuiting of resistors or rheostats or tampering with the control may result in damaging the equipment.

In transporting welding equipment, rough handling resulting in permanent mechanical damage is all too frequent. Motor-generator sets mounted on steel wheeled running gear should be moved only at slow speeds—never behind fast-moving trucks or other vehicles. They should be eased over obstacles and depressions such as flange clearance grooves in tracks. Slings used for transportation of welders by crane should be carefully arranged to avoid damaging control boxes and other equipment.

Care should be taken to avoid using arc welders out-of-doors in unfavorable weather. Many machines now on the market are designed to be both semi-protected and drip-proof. This does not mean, however, that these welders should be used in rain or other precipitation without suitable protection.

At the discretion of the user, of course, drip-proof or even open motor-generator sets can be operated out-of-doors, provided they are protected from obviously damaging conditions by tar-paulins or temporary shelters.



# SPEED WIRE JOINTS

LEFT  
On Fixture Installations and Repairs, "Wire-Nuts", save valuable time.

BETWEEN  
"Wire Nuts" occupy very little space; especially suited for work in close quarters.

## ... AND CONSERVE CRITICAL MATERIALS!

"WIRE-NUTS" are available now! No delays—speed up the wiring of War Plants and homes. And save "critical" war materials—Lead, Tin and Rubber, as required for solder-and-tape joints. Time-saving "Wire-Nuts" bring you more contracts—more profits.

"WIRE-NUT" joints are better electrically—safe, prevent shorts at wire joints; stronger mechanically—withstand several times the pull of the best soldered joint.

"WIRE-NUTS" make a neat, craftsmanlike job that passes inspection quickly.

**MILLIONS IN USE**—Thousands of electrical contractors have standardized on "Wire-Nuts"—FULLY APPROVED. Listed by Underwriters' Laboratories, Inc.

**SIZES FOR EVERY JOB**—For everything from small conduit fittings up to sizes large enough to join 3 No. 10 wires. WRITE FOR FREE SAMPLES, NOW!



Solderless, Tapeless Wire Connectors

### Other IDEAL War-Time Wiring-Job Speeders

- Fish Tape Reel and Puller
- Wire Strippers
- Joist Borers
- B-X Armor Cutter
- Cable Ripper
- Switch Box Supports

### SOLD THROUGH JOBBERS

IDEAL COMMUTATOR DRESSER COMPANY  
1041 PARK AVENUE SYCAMORE, ILLINOIS

Sales Offices in All Principal Cities

# Questions ON THE Code

**Answered by**  
**F. N. M. SQUIRES**  
 Chief Inspector New York Board of Fire Underwriters

## LIGHTNING ROD GROUNDING

**Q.** "Can we ground the lightning arrester rod on the chimney of a boiler room to a water pipe or should it be grounded otherwise?"—N. S.

**A.** Otherwise is best. Authorities on this matter state that the lightning rod grounding should be by rods or pipes—preferably non-ferrous—driven at least ten feet into the ground and in as straight a line as possible with the vertical down conductor of the lightning rod.

It is best not to tie the grounding to the lightning rod in with the water piping as doing so might tend to raise the potential on various parts of the water piping within the building to dangerous values.

**Q.** "In order to eliminate plugging or overfusing, it is proposed to protect each 3-wire receptacle with a single pole, 20 ampere circuit breaker. Is this good practice, or can you recommend something better?"—J. B.

**A.** It would be better to use a 15 amp. protective device and if the trailer is wired for 110 volts it must be of not over 15 amps. If a circuit breaker is to be used it would be better to use one with a magnetic trip rather than one which has only a thermal trip. Again the 15 amp. device should be used on 110 volts.

**Q.** "Will 3-conductor, No. 12 or No. 10 stranded type "S" heavy duty portable cord be OK for this job?"—J. B.

## CONNECTIONS FOR TRAILERS

It is desired to equip a trailer camp with suitable electric wiring to take care of say 24 to 30 trailers of the type used in the United States and Canada.

**Q.** "It is proposed to provide 3-wire, 20-amp, 110-volt plug-in receptacles at three or more locations, the third wire being used to ground the trailer. Is this good practice? Is there a better method?"—J. B.

**A.** The method mentioned is undoubtedly the best method, but as all trailers will not be equipped for this kind of a connection, a terminal grounding connection should be provided in order that a separate grounding wire or jumper may be attached between the frame of the trailer and this connection.

**A.** Yes.

**Q.** "Can you offer any suggestions as to the best methods of connection of the ground wires to the trailers?"—J. B.

**A.** Trailers designed to be connected to an outside supply source must be provided with an approved junction box and receptacle. This box must be grounded to the metal frame of the trailer. This then, is the point at which the grounding should be done and the method stated in Question 1 is the best and the method suggested in Answer 1 is next best.

## CARRYING CAPACITIES OF WIRES

**Q.** "I understand that the National Electrical Code has been changed so that we may now use the old table of carrying capacities of wires as given in the 1937 Code. Is this correct?"—T. W.

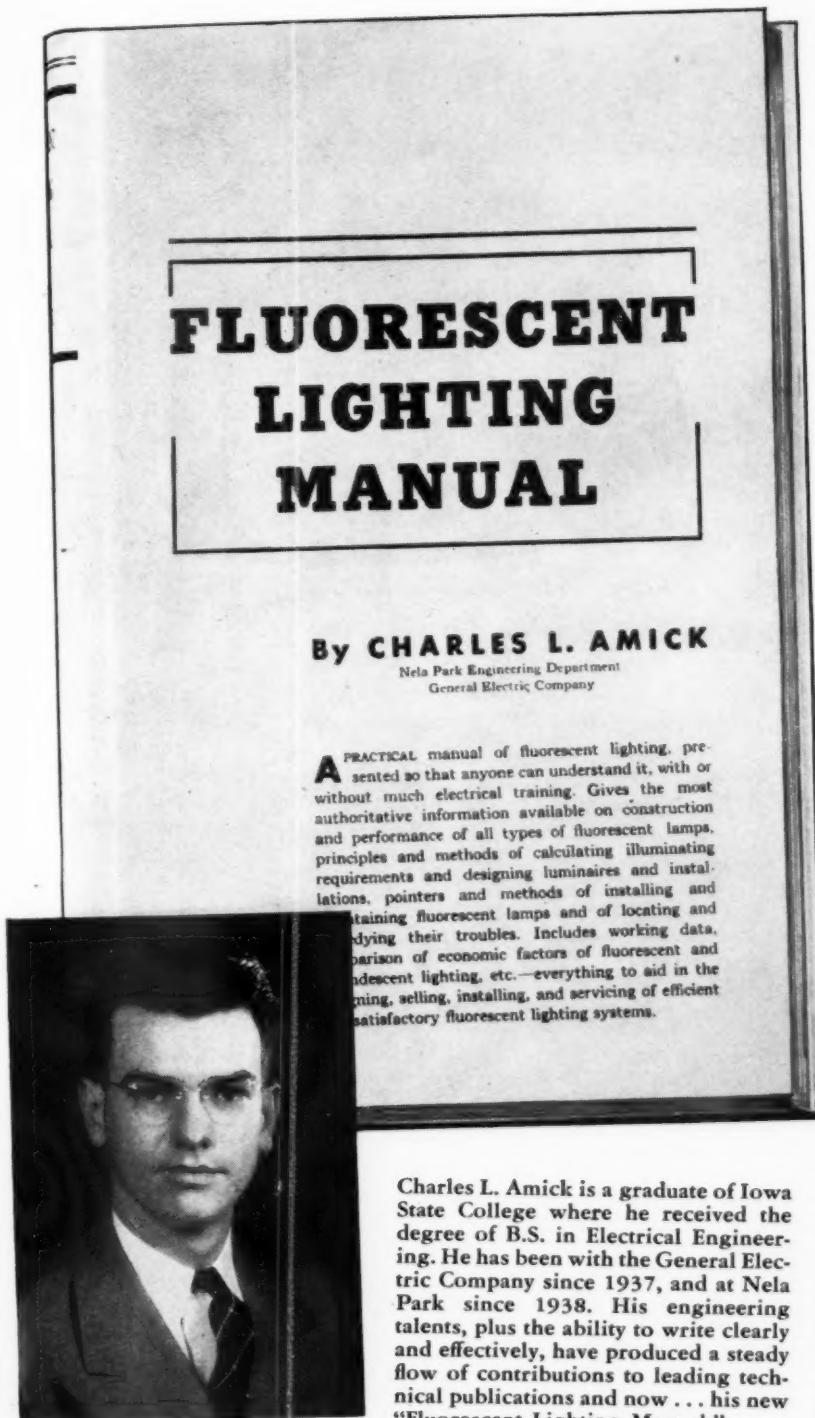
**A.** Yes, in general with a certain exception.

As a war emergency measure and only for the duration, the 1937 table of carrying capacities of wires, column A may be used for type R wires with this exception: It is to be used only with wires of Code grade rubber insulation that are not operated continuously with maximum current. This is in accordance with Interim Amendment No. 41 to the National Electrical Code as approved by the Electrical Committee NFPA.



PRIORITIES QUIZ at the recent Wolverine State Electrical Contractors meeting is chairmen by Jay Biddle (left) as James Wilson (standing) and T. I. Easton, of the Southern Michigan District, Priorities Division, W.P.B., give all the answers.

# NOW...A "MUST" FOR EVERY LIGHTING MAN- FIRST COMPLETE MANUAL OF FLUORESCENT LIGHTING



A PRACTICAL manual of fluorescent lighting, presented so that anyone can understand it, with or without much electrical training. Gives the most authoritative information available on construction and performance of all types of fluorescent lamps; principles and methods of calculating illuminating requirements and designing luminaires and installations; pointers and methods of installing and maintaining fluorescent lamps and of locating and curing their troubles. Includes working data, comparison of economic factors of fluorescent and incandescent lighting, etc.—everything to aid in the planning, selling, installing, and servicing of efficient satisfactory fluorescent lighting systems.

Charles L. Amick is a graduate of Iowa State College where he received the degree of B.S. in Electrical Engineering. He has been with the General Electric Company since 1937, and at Nela Park since 1938. His engineering talents, plus the ability to write clearly and effectively, have produced a steady flow of contributions to leading technical publications and now... his new "Fluorescent Lighting Manual."

HERE, in 312 instructive and interesting pages, clearly and concisely written in layman's language, is the first complete and authoritative treatise on fluorescent lighting.

Written by Charles L. Amick, of the General Electric Company's Nela Park Engineering Department, the "Fluorescent Lighting Manual" is designed to provide in one book the fundamental knowledge needed to solve the practical problems of fluorescent lighting application.

Even persons with only a limited electrical background can gain a wealth of information on fluorescent lighting from this outstanding new book. Among its contents are a description of the construction and performance of all types of fluorescent lamps; an explanation of the principles and methods of calculating illumination requirements and designing installations; hints on installation and service; and a discussion of lighting economics.

Every utility lighting executive, engineer and salesman should have a copy of this new book, which already is being hailed as an exceptional contribution to the science and art of lighting. Copies, priced at \$3.00, may be obtained from any bookseller or direct from the McGraw-Hill Book Company, Inc., New York.

## CONTENTS

- 1 The Fluorescent Lamp
- 2 Auxiliary Equipment
- 3 Operating Characteristics
- 4 Installation Hints
- 5 Service Suggestions
- 6 Luminaire Selection
- 7 Fluorescent-Lighting Design
- 8 Color Quality
- 9 Fluorescent Applications
- 10 Lighting Economics

G-E MAZDA LAMPS  
**GENERAL ELECTRIC**

# GENERAL ELECTRIC ANNOUNCES NEW FLUORESCENT LIGHTING INVENTION saving millions of pounds of critical materials within next six months!

**New Sequence-Starting Circuit**  
uses only one ballast for  
four 100-watt fluorescent lamps  
. . . increases light output 8%

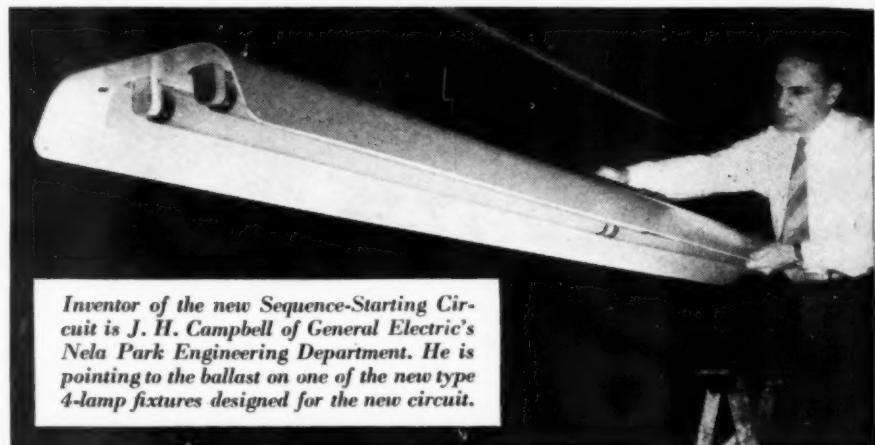
GENERAL ELECTRIC announces a revolutionary new type of fluorescent lighting circuit that can save millions of pounds of critical war materials within the next six months. The new Sequence-Starting Circuit requires only one ballast to operate four 100-watt fluorescent lamps in a single fixture instead of the two ballasts formerly required. Invented by a young Nela Park engineer, J. H. Campbell, and covered by U. S. Patent No. 2,266,619, it is now available for war industries.

Originally developed to save critical materials as an emergency alternative to the inductive method of operating fluorescent lamps, the new Sequence-Starting Circuit has surpassed all expectations.

#### Advantages of new circuit

- 1 Critical material necessary in ballasts cut approximately in half.
- 2 Cost of ballast equipment reduced 50%.
- 3 An overall reduction in fixture cost of approximately 20%.
- 4 Marked saving in weight.
- 5 Overall light output increased 8% per watt consumed.
- 6 Number of lead connections reduced from 8 to 3.

Although the Sequence-Starting Circuit may be used only on 254, 265 and 277 volt circuits, many new war plants have that voltage available while other plants can be chang-



Inventor of the new Sequence-Starting Circuit is J. H. Campbell of General Electric's Nela Park Engineering Department. He is pointing to the ballast on one of the new type 4-lamp fixtures designed for the new circuit.

ed over to take advantage of G.E.'s latest fluorescent development.

#### Savings Effected

The use of the Sequence-Starting Circuit results in important savings in critical materials. Per 4 lamp fixture these include:

Copper . . . 2.49 pounds.  
Iron and steel . . . 8.8 pounds.  
Aluminum . . . 0.345 pounds.

That's enough copper to make ten 20mm. cartridge casings . . . enough

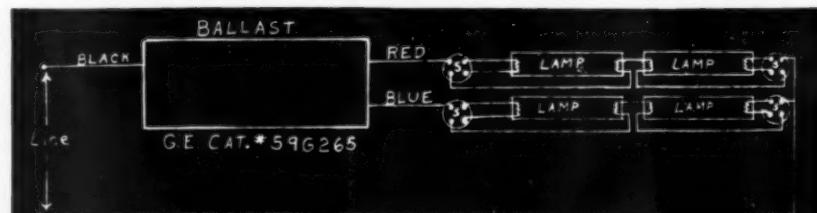
iron and steel to make thirty-five 20mm. shells . . . enough aluminum to make ten fuse primers.

It is estimated that potential savings that may be effected by this new circuit in the next six months are:

Copper . . . 500,000 pounds.  
Iron and steel . . . 1,750,000 pounds.  
Aluminum . . . 70,000 pounds.

For complete details, see your General Electric lamp division office or write General Electric Co., Dept. 166-EC-8, Nela Park, Cleveland, O.

#### HERE'S HOW THE NEW CIRCUIT WORKS:



The New Sequence-Starting Circuit requires only one ballast to take care of four 100-watt fluorescent lamps operated in series on a 254, 265 and 277 volt A.C. circuit. Each lamp requires one standard FS-74 thermal switch starter. The one split-phase ballast required is covered by U. S. Patent Nos. 2,056,629 and 2,025,471 held by General Electric. Certified by Electrical Testing Laboratories.



# *A Natural* for War-plant Lighting

## THE NEW **4-LAMP BALLAST**

Operates four 100-watt fluorescent lamps, yet costs no more than a Tulamp 100-watt ballast.

Reduces copper requirements of plant lighting circuits. Operates over a line-voltage range of 250-280 volts; applicable to circuits in the 265/460-volt-Y class.

Cuts ballast electrical losses 46 per cent for a given installation—an appreciable power saving.

Saves nearly 50 per cent in ballast materials for a given number of lamps.

THE new G-E four-lamp ballast—made possible by General Electric's revolutionary sequence-starting circuit—opens the way to simplified fluorescent fixtures that cost less, weigh less, and use much smaller amounts of critical materials: copper, iron and steel, and aluminum.

Compared with two 100-watt Tulamp ballasts—the most economical type previously available—the new four-lamp ballast requires 48 per cent less copper, 47 per cent less iron and steel, and 50 per cent less aluminum.

### Savings in Copper for Plant Circuits, Too

Circuits carrying power at the higher voltages (between 250 and 280 volts) necessary for the operation of the new ballast require much less copper than circuits carrying the same amount of power at lower voltages. For example, on a single-phase circuit only one-fourth to one-third as much copper is required to carry power at 265 volts as would be required to carry it at 115 volts. Many new war plants—particularly those with load-center distribution systems—will have Y-connected circuits of 254/440, 265/460, or 277/480 volts, to all of which the four-lamp ballast can be connected

line-to-neutral. Other plants converting for war production can often provide one of these voltages on their lighting circuits.

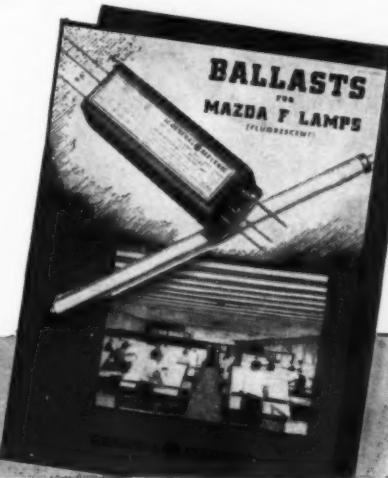
The four-lamp ballast has the same mounting dimensions as the G-E Tulamp ballast.

Power factor of the four-lamp ballast, like that of the Tulamp ballast, is above 95 per cent.

Write today for complete information on this remarkable new ballast. Ask for Bulletin GEA-3293D. It contains information on the complete line of G-E ballasts for all MAZDA F lamps from 4 to 100 watts. *General Electric Company, Schenectady, N. Y.*



The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment



**GENERAL ELECTRIC**

460-9-5305

# Save with ILLINOIS

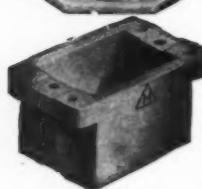
All Porcelain  
WIRING SYSTEMS...

- ★ USE LESS VITAL MATERIALS
- ★ DO JOBS IN LESS TIME
- ★ CUT MAINTENANCE



OUTLET BOXES

Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.



SWITCH BOXES

Insure greater safety in wiring and the elimination of all grounding hazards. Made of best quality white porcelain. Metal inserts are placed in two holes of the switch boxes for receiving screws of standard switches, plugs, outlets, etc. Knockouts for single wires, also for cables. Specify and use them.



STANDARD TUBES

In sizes  $\frac{1}{2}$  to 48 inches,  $\frac{5}{16}$  to 3-inch diameter in following types: unglazed, glazed, split, floor, split floor, headless, curved end, cross-over split, and crossover. Diameters all uniform both inside and outside.



KNOBS

Cement coated—nail—genuine leather-washer—code standard. They don't chip when driven in and they stay in place.

TOGGLE SWITCH PLATE

All porcelain with beveled edge and decorative pattern on face.

CLEATS

Standard one, two, and three-wire types.



**BULLDOG**  
REGISTERED

**ILLINOIS ELECTRIC PORCELAIN CO.**  
MACOMB, ILLINOIS

Questions  
ON THE CODE

[FROM PAGE 66]

If the operation is "continuous" then the tables of the 1940 Code are used.

The perplexing question as to what a "continuous operation" may be has now been settled by another Interim Amendment (No. 66) which states that "continuous operation . . . . is operation where the load exceeds three consecutive hours of six non-consecutive hours at the maximum rating listed, during any 24 hour period."

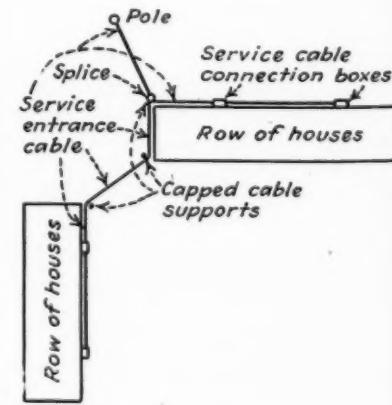
Another interim emergency amendment for the duration is No. 63 which permits the use of column B of the 1937 table for wires having insulation of types AVB and V in sizes No. 4/0 to 2,000,000 and where not operated continuously with maximum currents and permits the use of Column B of the 1937 table for types AVA and AVL in sizes 500,000 to 2,000,000 where not for continuous loads.

For wires smaller than those mentioned above and for continuous operation the 1940 tables must be used.

## Taps to Service Entrance Cables

**Q.** "We are using service entrance cable Type U in the run from the poles to the buildings on various defense housing jobs.

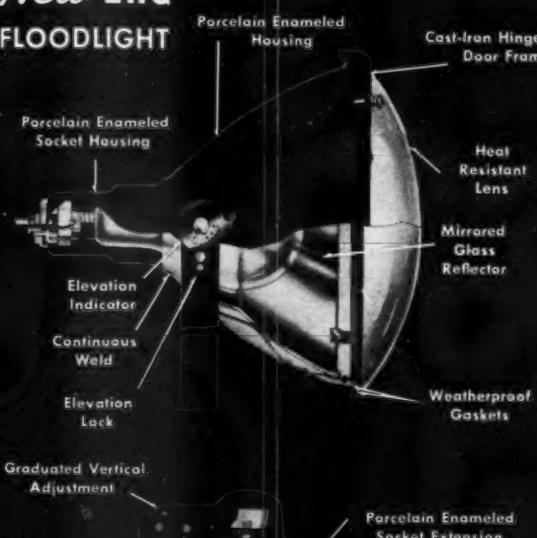
"We have several cases where it is necessary for us to make splices in this cable. The conditions we have encountered are as noted on the sketch below. Will you please advise us if it is permissible to make splices at the locations we have indicated? Is it necessary for us to use some other method of running this cable?"—A. R.



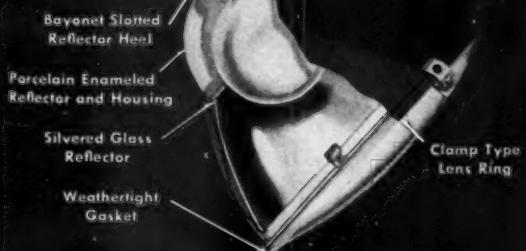
**A.** The taps as indicated are permissible under Sections 2307b and 2302b of the Code. Of course insulated supports shall be provided for the cables so that no strains will be imposed on the splices.



### New EHG FLOODLIGHT



### New VEG FLOODLIGHT



## NIGHT LIFE-U.S.A.

For the safety of America's new night life, we've designed a line of all-purpose floodlights which have industry-wide applications for protecting fence lines, plant buildings and outdoor production. Lightweight and weatherproof, these new units range in size from eight inches to eighteen inches.

Westinghouse Types EHG, with universal burning lamp, and VEG, with vertical burning lamp, are constructed of sheet iron. A choice of narrow beam reflector (metal-backed glass) or wide beam reflector (porcelain enameled) with various lens and lamp combinations provides a complete range of beam spreads. Both types of floodlights have graduated, locking adjustments to facilitate aiming and relamping.

Producing these floodlights and providing complete application engineering service are all-out war jobs at Westinghouse today. The nearest Westinghouse Lighting Specialist will gladly help answer your protective lighting problems, or you may write for a new *Protection With Light Planning Book*, B-2280-A, Westinghouse Electric & Manufacturing Co., Edgewater Park, Cleveland, Ohio.



# Westinghouse

## *Lighting Equipment*

# Modern Lighting

## MARSHALL FIELD DRAPERY DEPARTMENT

Close cooperation between the architect and the lighting man can result in a pleasant, attractive atmosphere such as shown here. In this location adequate light is required to reveal both the pattern and the texture of the drapery on display. Two rows of white mazda F



**WHITE FLUORESCENT** lamps in a cove with luminous soffit light walls and ceiling, louvered bottom luminaires furnish direct illumination.

lamps in a staggered arrangement in the cove with a luminous soffit produce desirable wall and ceiling brightness and a quiet atmosphere to the department. Six-lamp closed-top louvered-bottom luminaires incorporated as an integral part of the architectural treatment, furnish most of the illumination on the merchandise as well as providing an interesting ceiling pattern.

## HIGH BAY LIGHTING

The high efficiency, high-output-per-lamp characteristic of H-1 mercury lamps make them a natural for many industrial lighting jobs—particularly for mounting heights of 20 feet or above. In most cases it is desirable to use them in combination with filament lamps, preferable in an alternate staggered ar-

rangement. The resultant color quality of light fits in very suitably for high bays where there is an adjacent low bay lighted with mazda F or RF lamps. Of course, there are many industries where the "mercury" color is quite satisfactory.

In some special high-bay areas fluorescent lamps have been recommended in place of H-1 lamps such, for example, as airplane assembly plants. This is principally because the men assembling airplanes look up frequently and also because there are specular surfaces of all contours and sizes. Here the lower brightness of fluorescent lamps improves seeing conditions greatly.

For the great majority of high bay areas the H-1 lamp alone or in combination provides a highly satisfactory quality of lighting at a lower installation cost and often at reduced operating cost.

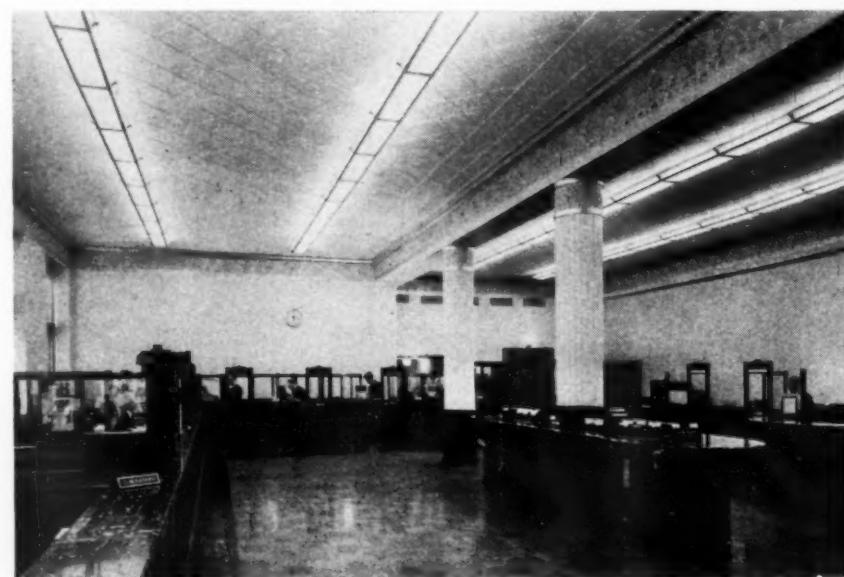
While installation costs vary widely because of varying labor rates and in-



**HIGH BAY MERCURY** incandescent combination units on 4-foot centers provide high intensities with good color quality in this war plant.

stallation practices, in a great majority of cases H-1 mercury lighting is cheaper to install than any other system except straight filament lighting, and the mercury system provides the lowest overall cost of operation for power costs between one to two cents per kilowatt hour.

Tests show that most reflectors combining filament and mercury lamps result in relatively low-efficiency unit. Also, in many cases low-wattage filament lamps are used with a corresponding sacrifice in lamp efficiency. For these reasons, the alternate staggered system is best recommended with spac-



**BANK LIGHTING**—One of the essential requisites in a bank is accuracy. Good lighting can help to promote accuracy by enabling bookkeepers, tellers, etc., to see with certainty what they are doing. An excellent example of bank lighting is illustrated by the Peoples National Bank of Washington, Seattle, Washington. The room is 50 by 64 feet. Sixty-five foot-candles are provided by four continuous rows of units each equipped with 40-watt F lamps covered with Corning lens plates with carved diffusing glass side panels.

## The DAY-LINE...CONTINUOUS

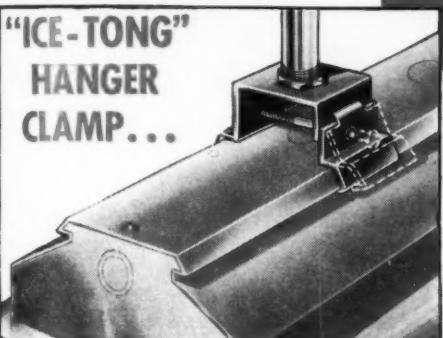
Provides a flexible method for installing long, unbroken lines of luminaires. Removable reflectors.

Patents Pending.

DAY-BRITE

COMPLIANCE WITH  
DEFINITION AND  
SPECIFICATIONS  
OF THE ALUMINUM  
SOCIETY CERTIFIED  
ELECTRICAL FIXTURE  
LABORATORIES

Now . . . MORE SPEED  
IN INSTALLATION  
is an added feature of  
THIS FLUORESCENT FIXTURE THAT  
MAKES THE MOST OF LIGHT



### "ICE-TONG" HANGER CLAMP...

It's Good News for the  
MAN WITH THE SCREWDRIVER

To hang the DAY-LINE Fixture, merely slip the wireway housing between the open jaws of the Day-Brite "ICE-TONG" Hanger Clamp. The fixture is held in place by its own weight—turning down the single screw in the hinged clamp makes the assembly rigid, substantial.

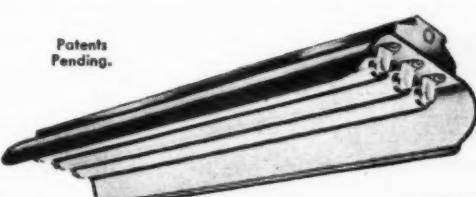
HERE'S ANOTHER CASE where greater speed is achieved through mechanical simplicity: With the new Day-Brite "ICE-TONG" Hanger Clamp, it isn't necessary to "spot" exact ceiling locations for mounting hangers or conduit. These clamps can be positioned at any point that is parallel to the entire length of the unit or continuous Day-Line fixture. That's all there is to lining them up.

This faster installation feature is a product of Day-Brite engineering, which is not alone content to design fixtures that utilize the most of fluorescent... It steps off another milestone in the March to Victory—Light that's Right can now be made available faster.

DAY-BRITE LIGHTING, INC. • 5478 BULWER AVE., ST. LOUIS, MO.

Patents Pending.

The DAY-LINE UNIT... The  
same construction as the  
DAY-LINE CONTINUOUS.  
Can be used as units or in  
parallel batteries.



The COMPLETE LINE OF FLUORESCENT LIGHTING FIXTURES Nationally distributed through all leading electrical supply houses

# for PROTECTION



***be sure they're E·T·L\* certified***



**Ballasts and Starters**—  
the "control units" that  
regulate lamp opera-  
tion—have more to do  
with the satisfactory

performance of fluorescent lamps than any other part of the fixture. That's why it's important to take these two simple precautions when you're planning fluorescent lighting, or making occasional necessary replacements in older installations.

1. Be sure that the starters are Certified by \*Electrical Testing Laboratories.
2. Be sure that the ballasts are Certified by \*Electrical Testing Laboratories.

#### **Give your customers these advantages**

Longer lamp life. Greater lighting efficiency. Full use of the wiring system through high power factor ballasts. Long life and dependable service from the units themselves. ETL Certified Starters and Ballasts are a specified

## FLEUR-O-LIERS

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer

# and SERVICE

## sales and maintenance . . .



part of every Certified FLEUR-O-LIER. They're built to definite specifications set up by MAZDA lamp makers. You know they meet these specifications because they're tested and certified by Electrical Testing Laboratories. That means double assurance of dependable, trouble-free operation.

### Wherever fluorescent lighting is needed to speed the job . . .

Whether it's for a new or conversion war industry job, the value of reliable fluorescent lighting is making itself more evident than ever. That's why it pays to sell fixtures wearing the FLEUR-O-LIER label. It's the key to dependable service and maximum lighting performance.

FLEUR-O-LIERS are made in various sizes and designs by over 45 leading fixture manufacturers located at important points all over the country. This means better service on war plant



Over 45 manufacturers have earned the right to use this label!

orders, which, of course, are now filled on necessary WPB priority rating.

FLEUR-O-LIERS are *tested and certified* by impartial Electrical Testing Laboratories of New York as meeting 50 definite Standards set up by MAZDA lamp manufacturers for balanced performance and satisfactory operation.

**CERTIFIED FIXTURES  
FOR FLUORESCENT LIGHTING**  
who complies with FLEUR-O-LIER requirements



# "Skilled Lighting"



## to boost skilled output!



RLM DURATACH REFLECTORS

Made in Dome, Angle and all other standard types. Wheeler Duratach construction provides for quick installation and easy interchangeability of reflectors.



RLM SOLID NECK REFLECTORS

Made in Angle, Dome and all other standard types. Recommended for indoors or outdoors where interchangeability is unimportant.



WHEELER VAPOR-TIGHT FIXTURES

Made in all standard pendant and ceiling types. Designed to resist deteriorating effects of vaporous and atmospheric conditions.

**Wheeler-engineered Lighting "sharpens" eyesight, increases accuracy of production.**

Wherever workers' output must meet new high wartime tolerances, up-to-date lighting offers immediate opportunities for better, faster production. For such modernizations, you can't get better-engineered fixtures than Wheeler's!

### Developed by Specialists

Wheeler Lighting Equipment is designed by specialists with over 60 years' experience. It's "skilled" lighting that applies standard lamps with maximum efficiency. Every unit meets top standards of design, material and workmanship.

### Complete Selection

All your requirements can be supplied by Wheeler's complete line. Wheeler engineers will help you plan the right installation. Write for catalog of Wheeler Incandescent or Fluorescent Fixtures. Wheeler Reflector Company, 275 Congress Street, Boston, Mass. . . New York, Cleveland. Representatives in principal cities.

Distributed Exclusively Through Electrical Wholesalers

**Wheeler REFLECTOR COMPANY**  
Lighting Equipment Specialists Since 1881

**Modern Lighting**

[FROM PAGE 72]

ings not more than about 80 percent of the mounting height.

This illustration shows a machine tool plant at Milwaukee, Wisconsin. Holophane units are employed with the 400-watt mercury lamps in alternate units with the 750-watt incandescent lamp. The units are mounted 22 feet above the floor and spaced 14 feet apart to provide 45 foot-candles.

### FLUORESCENT TROFFER LIGHTING

An excellent example of troffer lighting is to be found in the Richmond, Virginia offices of the Prudential Life Insurance Company. This installation employs 17 rows of 48 inch mazda F lamps in 24-foot Daybrite troffers. The ceiling is 12 feet and the troffers are spaced 5 feet apart. When measured after one hundred hours burning, the illumination was 50 foot-candles.

While troffers are being widely used today it seems reasonable to expect an even greater use of this method of producing high quality lighting in the future. Added impetus to this results from metal shortages and while troffers have been made of metal, alternate ma-



TROFFERS on 5-foot centers with rows of 48-inch lamps provide a level of 50 foot-candles after 100 hours of service in this office.

terials of many different types are being examined. Just what form they will finally take is hard to say. It is known, however, that materials such as pressed-wood, cement, pottery, etc., have possibilities and collectively or individually, they are liable to make up the troffer lighting installations of the future.

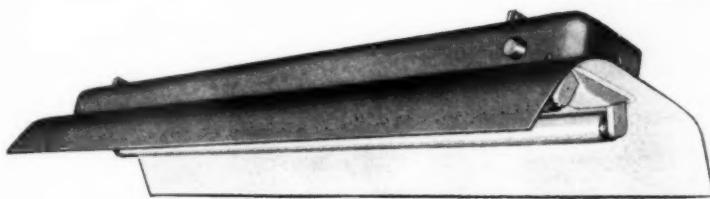
*Now Specify the*

# NEW *Type V* Benjamin Fluorescent Units

**for Productive Lighting**



## **New Reflector Specifications Provide Efficient Lighting for War Production Plants . .**



### **High Lighting Efficiency**

"Type V" units can be depended upon to meet, efficiently and economically, the needs of plants engaged in war production for the high lighting levels and the exceptional seeing comfort that is provided by fluorescent lighting.

### **Guaranteed by Benjamin**

These "Type V" units meet war production plant requirements for good fluorescent lighting. The lamps are adequately shielded for eye comfort. The reflection factor is 80% or more. The reflectors, auxiliary control equipment, sockets and other component parts are engineered for coordinated operation to provide maximum light output and trouble-free operation. "Type V" units are warranted to comply with all recognized illumination, electrical, mechanical and performance standards.

### **Let Benjamin Help You Meet Productive Lighting Needs**

Through these new "Type V" units, Benjamin fluorescent lighting equipment is available to solve many lighting problems confronting plants engaged in, or converting to, War Production. Keener eyes are vital in the produc-

**I**n keeping with the program to conserve steel vitally needed for ships, tanks and other war materials, it is now recommended that you specify the new Benjamin "Type V" Fluorescent Lighting Units which utilize a new, highly efficient, non-metallic reflector. These new units are available for either 48" or 60" fluorescent lamps in both the individual open end units (Twin-Flo, Triple-Flo) and the continuous channel, open end units (Lite-Line System).

tion drive, because basic to all production is the ability of the employees to see quickly, accurately and easily. Never has the need for good seeing been greater. Night shifts, six and seven day weeks, and sustained high speed production, have put a tremendous tax on the eyes, health and energy reserve of the worker.

### **Importance of Fluorescent Lighting to Production Drive**

Benjamin "Type V" units provide the amount of light and the quality of lighting needed by the employee to perform efficiently, the seeing task which is part of the work he performs. Such lighting plays a most important part in alleviating the tax on the eyes, in improving the seeing ability, and in minimizing fatigue.

### **Send Today for New "Type V" Bulletin**

For more details concerning the new "Type V" Benjamin units, write for new "Type V" Data Bulletin and a copy will be sent you promptly without cost or obligation. Address Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

**BENJAMIN**  
TRADE MARK

*type V*  
**FLUORESCENT LIGHTING EQUIPMENT**

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

**Paragon**  
TIMERS

**SAVE  
MAN-POWER**



900 Series

Of course you want to save man power and greatly step up total production. And if you're skeptical about Paragon Timers being able to help you do it — think a minute. Aren't there operations in your plant involving timing—such as machine operation, light exposure, power disconnect, conveyor operation, et cetera? If so, Paragon Timers have a place. Investigate them . . . find out how these precision built, accurate and reliable instruments are saving man power in hundreds of manufacturing operations.



*Write  
for this  
Book*

. . . . . describing industrial timers, time switches and other time controls. Contains illustrations, construction and installation data, list prices and reference information. To avoid delays, please furnish with your order for timers a preference rating of A-10 or better.

**PARAGON ELECTRIC COMPANY**  
401 South Dearborn Street, Chicago, Illinois

**Paragon**  
BUILDERS OF  
CONTROL INSTRUMENTS  
SINCE 1905  
*Chicago*

## Lighting a MANUFACTURING AREA

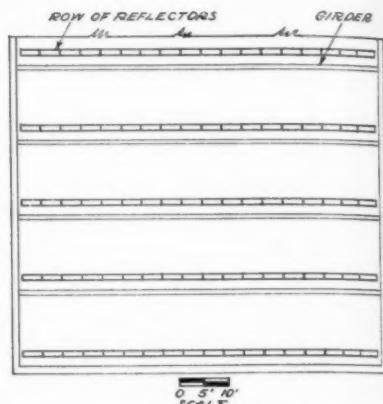
**PROBLEM:** To provide high-level general illumination supplemented by local lighting, both of proper quality for safe, efficient, comfortable performance of the difficult seeing tasks involved in special lamp manufacturing.

**CONSTRUCTION DATA:** The area lighted is 192 feet by 80 feet, with a 13-foot ceiling. Walls and ceilings are finished in flat white. The table tops are dark green linoleum. Work performed includes manufacturing, assembly, and inspection.

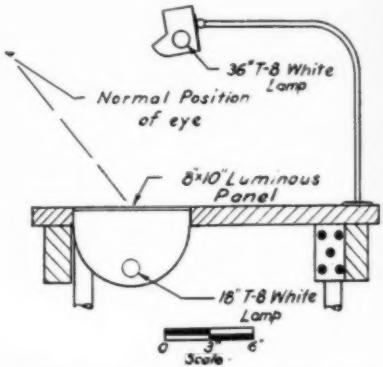
**SOLUTION OF PROBLEM:** The general illumination is provided by continuous rows of 4-foot RLM fluorescent open porcelain-enamel steel reflectors. Each reflector is equipped with two 48-in. 40-watt mazda F white lamps and represents a load, with auxiliary losses, of approximately 1000 watts. The rows are spaced on 10-foot 8-inch centers mounted 10 feet 6 inches above the floor. The wiring and high power factor auxiliaries are carried in a continuous wiring channel from which the individual reflectors are detachable for maintenance purposes. The RLM units incorporate tulamp ballasts which correct power factor and reduce stroboscopic effect.

Supplementary lighting at each work table is provided by one 36-in. 30-watt mazda F white lamp in a concentrating Alzak aluminum reflector. For certain operations involving seeing by silhouette, flush luminous panels 10 inches by 8 inches are provided in the tops of the work tables. These panels are of flashed opal glass lighted from below by an 18-inch 15-watt mazda F white lamp in a white cavity. Ballasts for the local lighting are installed under the table tops.

**RESULTS:** The average general illumination provided is approximately 40 foot-candles. At the working area, the general lighting plus the supplementary lighting from the trough reflectors provides approximately 250 foot-candles.



LAYOUT PLAN showing the arrangement of the continuous rows of fluorescent lighting units in this manufacturing area.



DETAIL OF the supplementary lighting equipment at the work tables. Flush luminous panels provide silhouette lighting.



HIGH LEVEL general lighting from continuous row reflectors are aided by specialized supplementary work table units, all fluorescent.

# YOU CAN BANK ON BOTH

For superior fluorescent performance!



## A STARTER THAT STOPS AS WELL AS STARTS

The Hygrade Premium Mirastat is the only standard starter that automatically cuts out a dead lamp. That means there's no overload on the ballast, since the only power used is the negligible wattage required to operate the starter. When a lamp burns out—it's all out—no long-continued blinks or flashes interrupt work or cause annoyance. Like all Hygrade starters, the Premium Mirastat assures accurately-timed starting and restarting through proper preheating of cathodes.

YOU can't have first-rate fluorescent lighting with accessories that are just so-so. Performance difficulties, time and again, can be traced back to starter troubles. Poor contacts in sockets, too, cause a lot of trouble.

## A COMPLETE LINE OF SOCKETS

Hygrade sockets cost no more than ordinary sockets. And they provide four outstanding advantages that make it easy to see why so many fluorescent users prefer them to any other kind:

1. They're stronger, more durable all over.
2. They're made so they don't break at the lamp insertion point.
3. They're designed so the lamps are easy to insert and can't fall out.
4. They're built so lamps always make positive contact with one easy twist.

Hygrade sockets and Premium Mirastat starters have demonstrated their superiority in countless installations. Proof of their dependability is the fact that they are now being employed, not only by Hygrade, but by other leading fixture manufacturers.

For complete information, write Dept. MEC-8, Hygrade Sylvania Corporation, Salem, Mass.

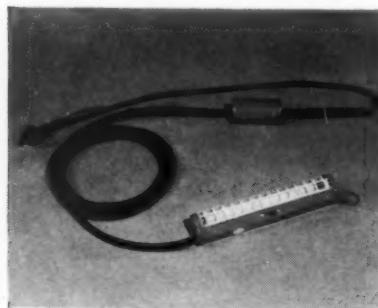
**HYGRADE SYLVANIA CORPORATION**  
**SALEM, MASS.**

*Manufacturers of HYGRADE Incandescent Lamps, Fluorescent Lamps, Fixtures, Starters, Sockets and Sylvania Radio Tubes*

# EQUIPMENT News

## Fluorescent Light

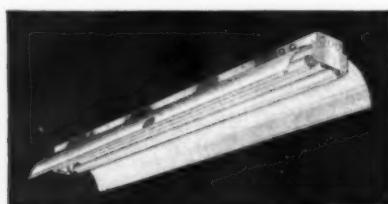
This fluorescent extension cord light is designed for work in confined areas and close inspection in war plants. Fixture may be clipped to worker's belt or hooked into lapel of coat, leaving both hands free. It consumes a total of 8 watts, including lamp and auxiliary. The grille protecting fluorescent lamp is constructed of heavy gauge steel. It operates on 110-125 volts, 60 cycle a.c. Overall length of unit is 9 $\frac{1}{2}$ -in., width 1-in. and height 1 $\frac{1}{4}$ -in. Hygrade Sylvania Corp.



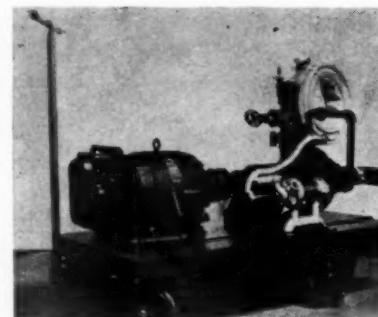
HYGRADE FLUORESCENT LIGHT

## Fluorescent Fixture

A new line of porcelain enamel industrial fluorescent luminaires has been developed. They are known as the XLO Flu-O-Flector, closed-end type and the Victory XLO, an open-end fixture. Units have been designed to use a minimum of steel. They feature the new "Bump-proof Socket Plates" to protect lampholders from breakage in transit, installation or cleaning. Starters are set in side of channel. Available for two or three 40 watt lamps and two 100 watt lamps. Luminaires may be mounted individually or in continuous runs with flush-ceiling or suspended mountings. Edwin F. Guth Co., 2615 Washington Blvd., St. Louis, Mo.



GUTH FLUORESCENT FIXTURE



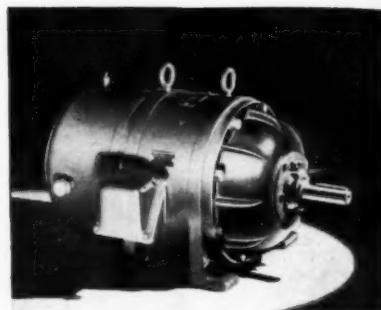
FAIRBANKS MORSE PORTABLE PUMP

## Pumping Unit

This portable pumping unit, electric motor driven, may be adapted to a variety of service. The pump is primed by means of a hand-operated bracket-type pump mounted on truck platform with its suction connected to the top of the volute through a 4-in. pipe line equipped with a shut off valve. The sludge is picked up through a length of 2 $\frac{1}{2}$ -in. wire lined rubber suction hose and discharged through a length of 2 $\frac{1}{2}$ -in. collapsible cotton fabric hose. The discharge hose is fitted with a gate valve to control head under high suction lift conditions and to seal the discharge of the pump during priming operations. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

## Fluorescent Circuit

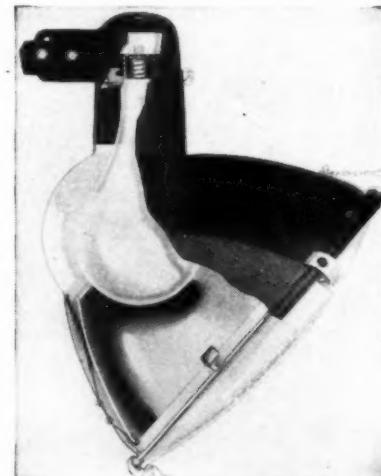
Development of a new circuit for fluorescent lighting fixtures and a specially designed ballast control unit has been announced. It permits the use of only one ballast, or control unit, with four 100-watt mazda fluorescent lamps in place of the present 100-watt fluorescent fixtures which require two ballasts for four lamps. The two lamps on each phase of the new circuit start in sequence and operate in series. It is designed for use only with 100-watt fluorescent lamps and on 254, 265 and 277 volt circuits. Some of the advantages claimed for this new ballast are—saving of nearly 50 per cent on critical materials; 50 per cent reduction in ballast cost; overall reduction in fixture cost of approximately 20 per cent; 8 per cent increase in light output per watt of current consumed and a marked reduction in weight of fixtures. General Electric Co., Nela Park, Cleveland, Ohio.



G-E POLYPHASE MOTORS

## Motors

A new line of polyphase induction motors in sizes from 1 to 20 hp., suitable for use under magnesium dust conditions has been announced. Labeled for Class II, Group E locations, this line should find use where fine magnesium dust is encountered. Motors are totally enclosed, with a non-ventilated construction in smaller ratings and fan-cooled construction above 2 hp. Cast-iron end shields, stator frames and fan housings make possible dust-tightness without complicating assembly or disassembly. Other features include non-sparking bronze external fans, relatively straight and smooth external ventilating passes for fan-cooled motors, to facilitate cleaning, permanently sealed-in leads. General Electric Co., Schenectady, N. Y.



WESTINGHOUSE FLOODLIGHT

## Floodlights

These new wide and narrow beam floodlights are designed for lighting shipyards, construction projects, industrial yards and sports areas. Both VE-18, wide beam and VEG-18 narrow beam units are equipped with snap cover having heat resisting glass lens, making them dust-tight and moisture-proof. A choice of narrow beam glass reflector or wide beam porcelain enamel reflector with various lenses and lamp combinations, 750 to 1500 watts, provide a range of beam spreads. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



**BLACKED-OUT  
War Production  
Plants...**

*depend on ARTIFICIAL LIGHT!*

Vital lighting . . . and vital machines of war production depend on current. No short circuits . . . no broken lines . . . no oil-soaked insulation must interfere. Central Conduit gives the dependable protection of rigid steel to guard against these dangers to all electrical circuits . . . buried or exposed. Central Rigid Steel Conduit is serving dependably in America's War Production plants.

*Guard Vital Circuits with*

**CENTRAL RIGID STEEL CONDUIT**

Sold by  
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GENERAL OFFICES: GRANT BUILDING  
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CENTRAL BLACK



CENLACO (HOT DIPPED)



**"THERE'S TESTED STRENGTH IN EVERY LENGTH"**

SPECIFY

# Compco FLOODLIGHTS for SAFEGUARDING MATERIALS and MANPOWER



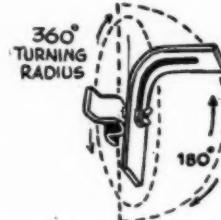
Sabotage is prevented before it happens when Compco Floodlights are on the job. No intruder can pass within range of these luminaires without fear of detection. Not only are man hours safeguarded, but night materials handlings are speeded up. Here's an item you can specify in quantity! You'll get them —on time!

Available For Better Floodlighting with a baked-on white "liquid plastic" reflector and baked-on industrial grey outside finish, three sizes. Write or wire for specification sheet and prices.



**COMMERCIAL METAL PRODUCTS CO.**

2251 W. ST. PAUL AVE. • PHONE ARMITAGE 1123 • CHICAGO, ILL.



Full up and down adjustment in any radius at any point.

EQUIPMENT News

[FROM PAGE 80]

## Lighting Fixture

A new development has been announced in the Day-Line industrial lighting fixture line. In place of the steel usually used in the porcelain enamel reflectors of these fixtures, they are now using a pressed-board that is given a 325° baked enamel finish. This new line includes Day-Line servicing and installation features, such as simple removal of reflectors and lamp starters and easy application of various methods of suspension including the "icetong" channel clamp. Available in single units and continuous fixtures and known as the "V-Series Day-Line." Day-Brite Lighting, Inc., 5411 Bulwer Avenue, St. Louis, Mo.



DAY-BRITE INDUSTRIAL FIXTURE

## That TRANSMISSION LINE fact you want is

HERE ▶

No matter what it may be, you will find complete data in this practical handbook for linemen, foremen, and other employees of line departments. This big home-study and reference volume is filled with the facts you need in order to do quick, safe, efficient work.

JUST OUT!

New 2nd edition of THE LINEMAN'S HANDBOOK

652 pages, 6x9, 682 illustrations, \$4.00

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- Elementary Electrical Principles
- The Electric System
- Distribution Circuits
- Line Materials
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- Line Protective Equipment
- Line control Equipment
- Fundamentals of Line Design
- Pole-line Erection
- Tower-line Erection
- Inspection, Testing, and Maintenance
- Rural Lines
- REA Manual of Operation and Maintenance
- Safety Methods in Construction of Overhead Lines
- Pole-top Resuscitation
- First Aid Talks
- Accident Prevention

This handbook covers everything the practical man wants to know about every phase of transmission line work. It is a handy volume packed with workable plans, methods, kinks, short cuts, tables, diagrams, and photos, on every aspect of materials, poles, towers, stringing, guying, trouble-shooting, first aid, etc. Use it as thousands of other line department workers have—to check your methods against the practice of others, to get fast, dependable answers to problems that arise on the job, to brush up on special points, and for constant study to improve your knowledge, grade and earnings.

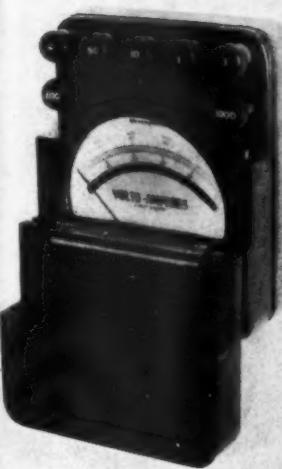
### 10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y.  
Send me Kurtz—The Lineman's Handbook for 10 days' examination on approval. In 10 days I will send you \$4.00 plus few cents postage or return book postpaid. (Postage paid on cash orders.)

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City and State .....  
Position .....  
Company ..... EC. 8-42



FRANK ADAM PANELBOARD



WESTINGHOUSE INSTRUMENT

### Instruments

These new P-14 portable a.c. and d.c. instruments are for general field service use. The molded cases are insulated and magnetically shielded from stray field influence. Available either with or without covers. Scale length is 3.2-in. a.c. and 2.8-in. d.c. and units have an accuracy of plus or minus one per cent of full scale. It has a variety of single and multi-ranges providing for measurement of a.c. volts, amperes and milliamperes; d.c. volts, amperes, milliamperes and micro-amperes. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

# Lighting for Victory

## ...SPERO

### INDUSTRIAL FLUORESCENT

To meet industry's stepped-up lighting requirements, SPERO offers these industrial fluorescent units . . . the IU 260 and the IU 248 (also can be had with perforations for three tubes at no extra charge). Both specially designed for plant use, these units' simplified construction provides easy maintenance and repair. All wiring, auxiliaries and starters are mounted in raceway above reflector. One-piece removable reflector is held by four thumb screws and can be readily dropped for cleaning. Reflecting surfaces are finished in "Plastox" white (88% reflector factor), which will not chip or flake.

Both the IU 260 and IU 248 are furnished for chain or rigid suspension mounting. Knockouts in top and ends make conduit or flexible cable mounting feasible. For chain suspension, a five position bracket is provided. Both units come completely wired ready to plug in, including pull switch—110-125 Volt A.C.

These two industrial fluorescent units are representative items in SPERO'S Five Lines . . . REFLECTORS—FLOODLITES—FLUORESCENT LIGHT-

ING—VAPOR PROOF UNITS—ELECTRICAL CONSTRUCTION MATERIALS. Write for complete details on any or all these lines . . . also prices and delivery data!



IU 260

IU 248

# SPERO

## ...5 LINES

of Products from  
one dependable source



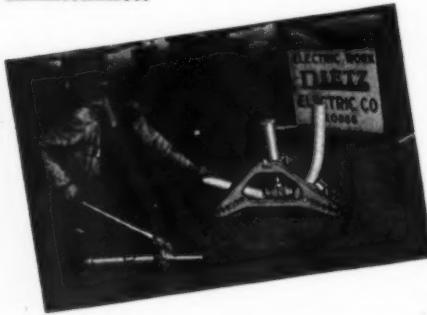
THE SPERO ELECTRIC CORPORATION  
18222 LANKEN AVE. ★ CLEVELAND, OHIO

## The **HEART** of a **PIPE BENDER**



**is its  
POWER UNIT!**

Pipe Benders have generally depended on hydraulic power from self-contained, "one-purpose" jacks that work only in limited positions. Blackhawk Benders are different — they have *Porto-Power Hydraulic Units*—hence, operation at any angle, light weight and extra utility. These same Porto-Power Units are widely used in many fields and are the only perfected equipment of their kind! Blackhawk is a specialist in building hydraulic equipment — and Porto-Powers are famous for their dependability, performance and freedom from maintenance.



Blackhawk Pipe Benders bend rigid conduit and pipe up to 4" diameter smoothly and without kinking. Save need for elbows, couplings, cutting and threading. Portable — lightweight — can be carried or rolled to the job and operated by one man to speed up construction and changeovers.

### MAIL COUPON TODAY

**BLACKHAWK MFG. COMPANY**  
Dept. P2082, Milwaukee, Wis.

Send Full Information on your Pipe Benders.

Name.....

Company.....

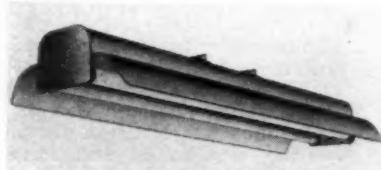
Address.....

## EQUIPMENT News

[FROM PAGE 83]

### Industrial Units

These non-metallic industrial fluorescent units have been so designed that approximately only nine ounces of steel are used in construction of housing and reflector. Knockouts are provided in housing at convenient intervals for easy wiring. Ballasts and starters are mounted in housing allowing reflector to be removed for cleaning or servicing. Reflecting surface is of Klasium white, a tough bonded white enamel. Other models are available with metal housing and non-metallic reflectors which may be used individually or in continuous runs. Lighting Products, Inc., 1221 Deerfield Road, Highland Park, Ill.



LIGHTING PRODUCTS INDUSTRIAL UNIT

### Floodlight

This new steel L-68 floodlight offers a choice of three reflectors. They are (1) chromium-plated reflector for narrow beam widths, (2) painted steel reflector for wider beam widths or (3) internal silvered glass reflector. Cast iron is used for socket housing. Asbestos gasket between reflector and housing keeps floodlight dry. Door glass is available in plain or stippled convex heat-resisting glass or floodlight may be operated as an open-type unit. A re-setting ring forms a repositioning stop in right-hand trunnion for crossarm mounting. Ring is also applicable as a horizontal repositioning stop when oval base and pipe clamp fittings are used. It accommodates the 750, 1000 or 1500 watt general service lamp. General Electric Co., Schenectady, N. Y.



G-E FLOODLIGHT

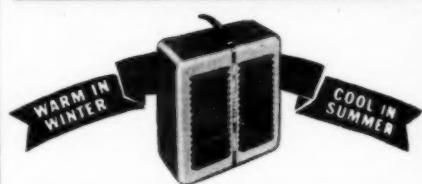
## RELAYS CONTACTORS

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A NEW LINE OF RELAYS  
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Electric Manufacturing Co.  
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## KEEP 'EM COMFORTABLE



### FOR INCREASED PLANT EFFICIENCY

#### PORTABLE ELECTRIC HEATERS

Watch production soar when you install Thermador Portable Electric Heaters. Enclosed fan forces out warmth or circulates cooling air. Light, compact, portable, may be moved about plant or office.

Equipped with four-position switch: cool, half heat, full heat, off. 8 foot cord, polarity plug. 230 Volts—50 or 60 cycles A.C., Single Phase. Sizes to 5000 Watts. Write for details.



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The Treasury's decision to increase the limitations on the F and G Bonds resulted from numerous requests by purchasers who asked the opportunity to put more money into the war program.

This is not a new Bond issue and not a new series of War Bonds. Thousands of individuals, corporations, labor unions, and other organizations have this year already purchased \$50,000 of Series F and G Bonds, the old limit. Under the new regulations, however, these Bond holders will be permitted to make additional purchases of \$50,000 in the remaining months of the year. The new limitation on holdings of \$100,000 in any one calendar year in either Series F or G, or in both series combined, is on the cost price, not on the maturity value.

Series F and G Bonds are intended primarily for larger investors and may be registered in the names of fiduciaries, corporations, labor unions and other groups, as well as in the names of individuals.

The Series F Bond is a 12-year appreciation Bond, issued on a discount basis at 74 percent of maturity value. If held to maturity, 12 years from the date of issue, the Bond draws interest equivalent to 2.53 percent a year; computed on the purchase price, compounded semiannually.

The Series G Bond is a 12-year current income Bond issued at par, and draws interest of 2.5 percent a year, paid semiannually by Treasury check.

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"What kind of a conduit line is this?"



"It's okay,  
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**NEXT WEEK!**"

When you are using Kondu, you can install the conduit line before you have the fittings.

You can do it because every Kondu box is a union. (Change boxes any time, without disturbing conduit. Another exclusive Kondu feature.)



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The Threadless Fitting Line  
of Unequalled Variety

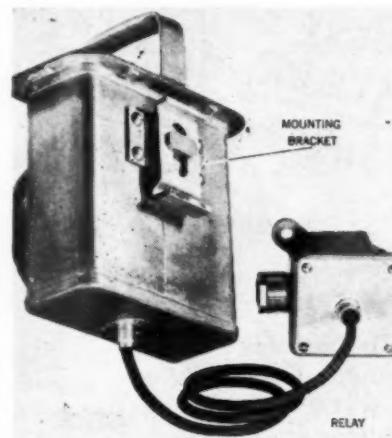


EQUIPMENT News

[FROM PAGE 84]

### Emergency Light

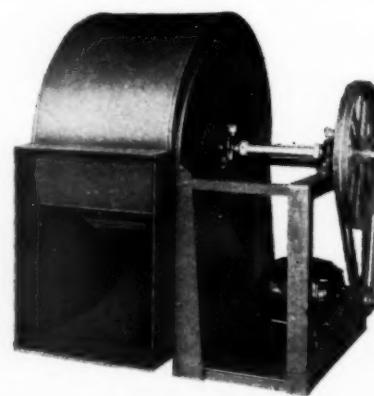
A new emergency light, which is made of stamped steel and has a shock-proof mounting bracket, has been announced. This lantern is connected to a gravity type relay which automatically places same in circuit upon the failure of the normal current supply. This Navy hand lantern is known as Type J-R-1. S. & G. Manufacturing Co., 149 Wooster Street, New York, N. Y.



S. & G. EMERGENCY LIGHT

### Blowers

A new line of utility blowers designed for ventilating and air conditioning. In the direct connected type there are 12 sizes with motors ranging in size from 1/20 to 2 hp. There are 26 sizes in the belt drive type with motors from 1/2 to 7½ hp. Belt drive units are furnished with variable pitch motor sheaves. All units can be furnished with or without weatherproof hood covers for drive mechanism. Peerless Electric Co., Warren, Ohio.



PEERLESS BLOWER

### MINERALAC HANGER



**Conduit 3/8"—2 1/2"  
Cable to 2 1/8" (with Bushings)**

**Cadmium and Everdur  
MINERALAC JIFFY CLIP**



**Sizes from .250" O.D. Tubing  
to 1 1/4" conduit.**

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### Floodlight

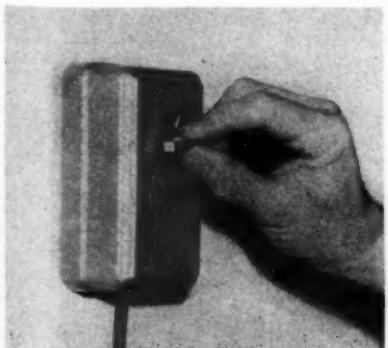
A new line of lightweight weather-tight, porcelain enamel floodlights for general and protective lighting of homes, farms and industrial plants has been developed. They are available in four sizes. The E-8 for 75 to 100 watt lamps; E-12 for 150 to 200 watt lamps; E-14 for 300 to 500 watt lamps; and E-16 for 750 to 1000 watt lamps. The one-piece reflector housing is made from heavy gauge sheet iron with a porcelain enamel finish. The E-8 and E-12 are recommended for street and sewer repair work, protective lighting of driveways and garages and entrances to industrial plant. The larger E-14 and E-16 units are designed for protective floodlighting of industrial plants, night construction projects and freight terminals and docks. Westinghouse Electric and Mfg. Co., Cleveland, Ohio.



WESTINGHOUSE FLOODLIGHT

### Automatic Timer

This electrical timing device is for use in industrial plants. Automatic time switch is arranged to close an electrical circuit after expiration of a pre-determined time, although it can be adapted for opening a circuit by reversing position of mercury switch element. When used on a.c. circuits, it has a capacity of 1200 watts, sufficient to control a 1 hp. motor of the repulsion induction type. A series connector with five feet of heavy duty cord is supplied to simplify connections to plug-in types of electrical equipment. The connector plugs into the electrical outlet and the apparatus to be controlled plugs into connector. Philco Corporation, Tioga and C Streets, Philadelphia, Pa.



PHILCO TIMER

# FIRST AID

for production cramps



Goodrich Highlite Reflector

Consider the overworked production man with all the problems in plant conversion—in pushing machines to the limit—training workers—fighting spoilage—stretching manpower to do more in less time!

By the hundreds, these men have found that first aid for speeding operations and reducing errors comes in the form of higher intensity illumination.

Answering this need in war plants, the new Goodrich Highlite Reflector is providing a new high standard of general illumination. Equipped with glass cover, this high bay fixture can also be furnished with an inner projector to concentrate still higher intensities where desired in specific working areas.

tensities where desired in specific working areas.

With hundreds of sizes and styles of porcelain enameled reflectors, Goodrich has answered every requirement in industrial illumination. Literature on request.

Protecting vital plants with floodlighting — saving man-hours in production — Goodrich Industrial Fixtures are serving America's war effort everywhere.



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TOOLS  
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These are just some of the items shown in our new 1942 144-page catalog. It is full of useful information and contains hundreds of illustrations that will be most helpful to you. Send for your copy today—ask for Catalog No. CF17.

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### "FINGER TIP" CONTROL

Large seamless copper tubes are carried in stock which are re-drawn by us to make into lugs of any size demanded.



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SINGLE HOLE  
SOLDERING  
LUGS

Wire size stamped on barrel. Tongues have smooth, flat contact surfaces. Barrel ends straight for snug fit. Shipped brightly clean. Can't leak solder. Side formed. Single hole.

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COPPER TUBE & PRODUCTS, INC.

## EQUIPMENT News

[FROM PAGE 87]

### Soder

Siloy soder is available in two grades for high or low melting. Grade 2 soder, the low melting, flows at about the same temperature as the ordinary half and half soder and gives strong joints. Grade 1 contains practically no tin, melts at a higher temperature and gives strong joints. It is applied in the usual manner. Grade 1 being higher melting requires a little more heat and spreading around with the iron than usual. This soder requires no priority. L. B. Allen Co., Inc., 6719 Bryn Mawr Avenue, Chicago, Ill.

### Switch

This new lightweight limit switch is designed especially for aircraft applications. Contact mechanism used is the G-E switchette. Snap action and double-break operation give switch a high current rating. Plunger operates with a  $\frac{1}{2}$ -in. overtravel, which increases number of applications for which switch can be used. Aluminum housing is made dustproof by use of gasketed cover. Switch is available in three contact arrangements: single-circuit, normally open or normally closed; and single-pole, double-throw. Each form can be furnished with a contact air gap of .010, .020, or .030-in. General Electric Co., Schenectady, N. Y.



G-E LIMIT SWITCH

### Photo-Electric Control

Type A28L control for outdoor and indoor use over long ranges has been added to this line of photo-electric protective systems. It is claimed that the light source projects a practically invisible light beam for distances of 350 to 700 feet and it is possible to completely surround power plants, defense factories and other vital areas. It is designed to operate 24 hours a day. Relay contacts are silver and will handle 15 amps. a.c. and 8 amps. d.c. Control operates from 115 volts a.c. Photoswitch Incorporated, 21 Chestnut Street, Cambridge, Mass.

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and  
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*Here's the kind of a man we're looking for. We don't expect to find all the qualifications rolled up in one individual—but the more you have the better.*

*He has a technical background. It will be fine if he is an electrical engineer—or civil, or mechanical. If he hasn't a fancy degree but does possess a practical knowledge of electricity and its applications, that's O.K. too. We'd be delighted if he has worked for a utility and/or an electrical contractor.*

*He likes to write. It's not painful for him to sit at a desk and pour out words describing installations he has seen—what engineers say about the products they use, and the kind of information they need to help them do their jobs better. He expresses himself clearly on paper and enjoys doing it.*

*He has written advertising, sales promotion or publicity for a manufacturer or publication—maybe not a lot, but enough to get the taste of printer's ink and to like the flavor.*

*He knows something about research methods and statistical analysis . . . can work up a pretty acceptable questionnaire and handle the procedure of mailing, tabulating returns and interpreting.*

*He's 25-35 . . . has a natural curiosity that will make him learn rapidly and grow in his job. He's a nice guy to have around and gets along well with his fellow workers.*

*The job is in the Sales Promotion and Market Research Department of two of McGraw-Hill's leading publications. If you're interested in the job and possess enough of the above qualifications to put you in the running, let's hear from you promptly please.*

### Market Research Dept.

## Electrical Contracting

A McGraw-Hill Publication

330 West 42nd St. New York

2. *Under-voltage Operation*—This condition, in plating generators can become very serious, since these units are essentially low voltage units, ranging, in general, from 0 to 45 volts. As an example; operating at 50 percent rated voltage means that the interpoles are too strong and adjustment should be made to the interpole air gaps. Whenever units are to be operated at other than rated volts and amperes, it is well to consider the matter thoroughly and make the proper adjustments.

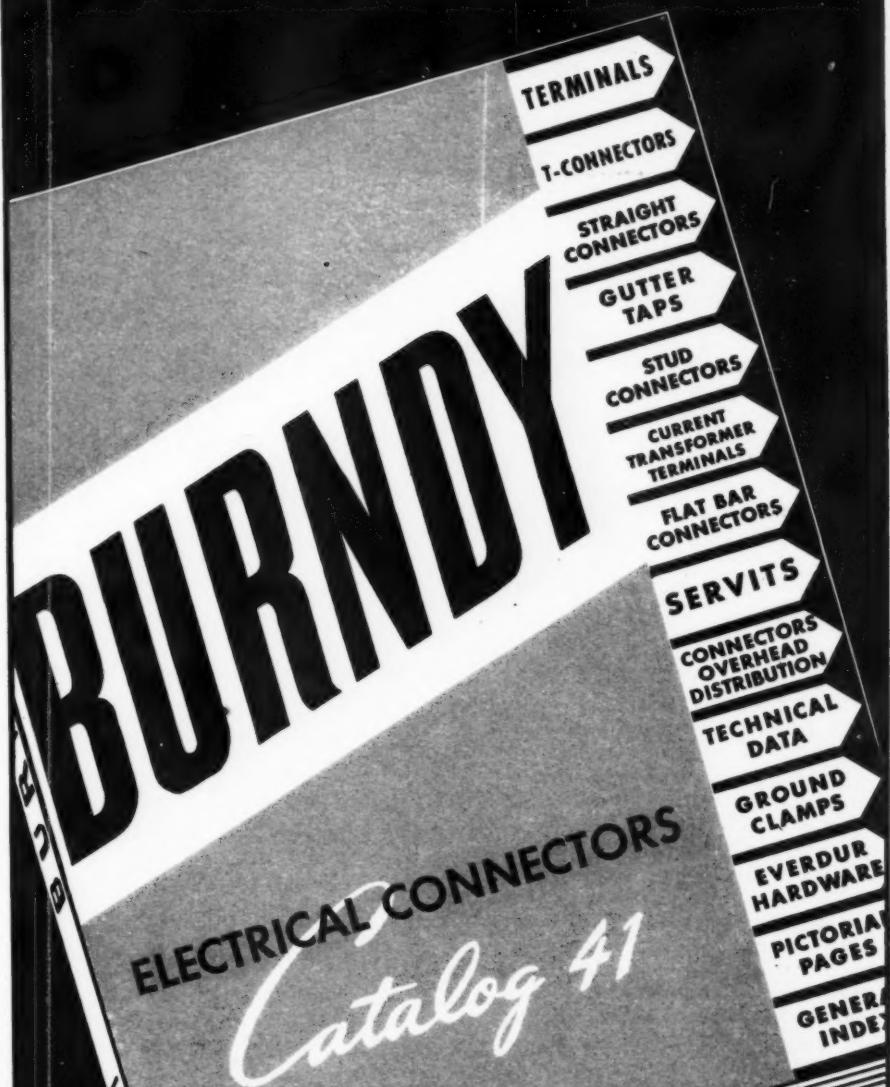
3. *Voltage Regulation*—For continuous plating operations, especially with conveyor systems, it is important to supply exact voltage regardless of the change in load. In the past this was done by adding compound wound main fields to the standard shunt fields of the generators. The closest regulation under this method was from three to five per cent. The latest method is to wind the generators with a straight shunt wound field and then use a voltage regulator to get exact voltage under all loads and through a wide range of voltage settings.

4. *Parallel Operation*—Much better parallel operation of plating generators can be obtained with shunt wound units and the proper voltage regulators. In large sizes, it is almost impossible to use equalizers between compound wound units because of the high amperes handled.

5. *Motor Rating*—It is important to use the proper size and type of motor to drive plating generators. It is interesting to note that to drive a 6-volt, 5,000 ampere generator, the driving motor size is just one per cent of the ampere rating—50 hp. With power factor as an important consideration much can be gained by using synchronous motors or the new Unity Power Factor Induction Motor as the driving unit. Furthermore, to insure coordination of equipment and overall high efficiency of operation it is advantageous to obtain the generator, driving motor, starters, generator control panel and exciter from the same manufacturer.

By proper application, careful operation and maintenance, maximum efficiency and minimum operating costs of plating generator equipment can be realized. Generator troubles can be practically eliminated and production can proceed unhampered—a vital point in our war industries today.

# Let this book SOLVE YOUR TOUGH CONNECTION PROBLEMS!



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# In the News

## N. Y. CONTRACTORS HOLD WAR CONFERENCE

Priorities, price ceilings and the wartime orders affecting electrical contractors were the major subjects discussed at the meeting of the New York State Association of Electrical Contractors and Dealers at Lake George, N. Y., July 1-4. The 43rd annual convention with a registration of 167 was devoted to the theme of an all-out war effort for the entire electrical industry.

The opening session on Manufacturers and Wholesalers Day was under the direction of Elmer A. Jones, Albany. C. McKew Parr, senior electrical consultant, Distribution Branch, WPB spoke on the distribution duties and contributions to the war. For the vast and complex structure of the War Production Board he urged patience and whole-hearted cooperation.

N. J. MacDonald, vice-president of Thomas & Betts described the operation of the Production Requirements Plans under which most manufacturers are now operating. He explained the course of preference orders through the various branches of the industry and its affect on the manufacturers ability to make deliveries. He urged the contractor to pass on preference ratings promptly and accurately. C. M. Ripley, General Electric Company, reviewed the contributions of the manufacturer in making essential parts for the machinery of war.

The latest in war essential lighting developments for industrial illumination and plant protection was described in an address by Willard C. Brown, director of industrial lighting, General Electric Co. and president of the Illuminating Engineering Society.

A. Lincoln Bush, chairman of the board of the State Association, opened the Contractors Day session. Quoting prophecies made at previous meetings, he urged the contractors to devote their full time to learning how best to serve the war effort. The question of profits must be forgotten, he said, and contractors must be ready to merge or work for each other if by such changes they can better serve their country.

James D. Lynett, Chief Inspector, City of New York, and Paul Ferneding, Superintendent, Bureau of Electricity, New York Board of Fire Underwriters, reviewed code changes and the cooperation of electrical inspectors in the war effort. E. H. Herzberg, executive assistant to the president, and Laurence W. Davis, general manager of

NECA, discussed the national regulations affecting electrical contractors and the work of the NECA Washington office.

Price regulations under the General Maximum Price Regulation on Commodities and Services was explained by Forrest E. Burrows, senior price specialist, OPA.

Election of officers returned the following to office for the 1942-43 period; A. Lincoln Bush, chairman; E. G. May, president; S. J. O'Brien, vice-president; J. F. Burns, treasurer and H. F. Janick, secretary. Walter T. Langdon of Utica was elected vice-president.

The convention was under the direction of E. C. Brown, Jr., Rockville Center, chairman and Louis Freund, vice-chairman.

## ILLINOIS INSPECTORS VIEW WAR DUTIES

More than 100 members of the Illinois Chapter, Western Section, IAEI, gathered at the Hotel Sherman, Chicago, on June 11, 12, to learn more about their duties under present war conditions. The inspector's part in promoting preventive maintenance and protection to reduce fire hazards and production breakdowns and the conservation of critical materials was the theme of the twelfth midyear meeting program.

Opening the program, A. J. McGivern, Chicago Electrical Wholesalers' Association, revealed the lack of copper wire for commercial, civilian, public and institutional electrical rehabilitation and urged the inspectors to immediately report unsafe conditions so an effort might be made to try to earmark some copper to keep these institutions operating safely. John Weber, outlined Commonwealth Edison's extensive defense preparations for the protection of their properties.

Blackouts and protection of personnel and equipment in war plants were discussed by Carl W. Zersen, Chicago Lighting Institute, and Major A. B. Pattou, plant protection officer of the Chicago Ordnance District. Latest information on the N.E.C., emergency code revisions and local ordinance revisions, was presented by A. S. Small, Underwriters' Laboratories; J. E.



"What did you specify on the delivery date when you applied for priority assistance?"

# SCRAP WILL WIN

THROW YOUR  
SCRAP INTO  
THE FIGHT  
!

**I**N every shop, every store, every home, there's a lot of junk. It is useless where it is, but mobilized, it can help win the war.

Old iron and steel, brass and copper, rubber, even burlap, paper and grease, are badly needed in huge quantities by American war industries.

It is the immediate duty of every individual to do his part in the drive to mobilize scrap. Keep it flowing through regular scrap collection channels so it can be processed into war material.

This is the way that your cooperation with the all-out effort of the steel industry can insure earliest possible Victory. **THROW YOUR SCRAP INTO THE FIGHT.**

**THE YOUNGSTOWN SHEET AND TUBE CO.**

**Youngstown, Ohio**

## In the News

[FROM PAGE 90]

Fisher, electrical inspector, Elkhart, Ind.; and V. H. Tousley, secretary, IAEI.

The two day session adjourned with technical discussions of the application of the N.E.C., and inspectors problems, led by V. H. Tousley and D. J. Talbot, president, Western Section, IAEI.

### CEILING PRICE STRUCTURES DEVELOP

As we go to press, there is no easy application of the OPA ceiling price structure to the electrical construction business. The lack of uniform pricing methods, the unlimited range of jobs in size and complexity, the great variety of commodities and services handled, almost universally on a "custom tailored" basis, defy orderly regulation. Though it is apparent that rules applicable would be difficult to enforce in their present form, price ceilings are the law and stiff penalties are provided. Every effort should be made to comply.

All business, unless specifically exempted or included in special schedules must establish ceiling prices according to the rules of the General Maximum Price Regulation No. 1. This freezes prices to the highest used on commodities and services delivered during March 1942.

The pricing methods described in Regulations No. 1, are readily applicable to certain types of time and material billings but offer no pricing formula for establishing ceiling prices on contract work where no two jobs are alike.

For contractors serving their communities at the retail level there are specific rules under Maximum Price Regulation No. 165, Consumer Services. The same pricing methods as provided in the General Maximum Price Regulation No. 1 apply with the addition of another method. Where

there are no established prices the pricing method must be the same as that used in March 1942 and must not exceed a combination of:

1. Direct labor at the highest rate in effect for each type of employee in March 1942.

2. Material at the maximum price established for purchase by the seller, or if no maximum has been established, the March 1942 cost.

3. Average margin, as a percentage of cost, over direct labor and material as it was figured during March 1942.

4. Less all discounts and allowances granted during March 1942 to purchasers of the same class.

Consumer services under this Regulation except sales to an industrial or commercial user. An unofficial statement by a member of the Washington OPA staff indicates that Regulation No. 165 may be amended to include sales at industrial and commercial levels.

Maximum Price Regulation No. 136, Machinery and Parts; and Machinery Services has been unofficially interpreted as applying to electrical construction. The list of products to which it applies includes 37 types and classifications of electrical equipment and wiring materials which would be major portions of any possible wiring jobs. Under section 1390.10, *Maximum Prices: sales by sellers other than the manufacturer*; the pricing method must not exceed in markup the average used on or about October 1, 1941. At the close of this section, however, paragraph (f) appears to remove the contractor from the provision of the regulation: *"Installed Sales.* Nothing in this Maximum Price Regulation No. 136, as amended shall be deemed to establish maximum prices for installation services performed by persons other than the manufacturer or assembler of the machine or part to be installed."

Whether this exempts the contractor entirely from Regulation No. 136 or only that portion of his sales devoted to the actual installations (labor and direct job expense) is still in question as this report is written.

In general, present ceiling regulations freeze prices at the March 1942 level with some commodities rolled back to the October 1, 1941 level. When a specific method is ironed out for electrical construction it will probably involve average March pricing methods on invoiced cost of materials and labor. A clue to the applicable labor rates is given in the regulations for manufacturers under regulation No. 136. They are permitted to base ceiling prices on labor rates in effect on or before April 27, 1942 and where the wage stabilization agreement issued May 22, 1942 between the Building and Construction Trades Department of AFL and certain agencies of the United States is applicable, labor rates in effect on July 1, 1942.

There is a common but erroneous report current that sales to government agencies are generally exempt from price ceilings. This is true only in certain limited cases. Government purchasing bodies are exempt from those liabilities and penalties of the of the Regulation which are imposed upon buyers who violate the price ceilings. The seller is still responsible.



**STATE LICENSING** of electricians and labor's approval of a tentative bill was outlined at the recent Tennessee Electrical Contractors convention in Chattanooga by C. C. Sutton, representing the Tennessee Electrical Workers Association, Memphis.

### WPB TIGHTENS WIRE PRIORITIES

WPB's Building Materials Division has notified electrical contractors that priority assistance cannot be granted any longer for insulated wire and cable to wire buildings or parts of buildings which can get along for the duration without electric service.

In effect, the ruling means that no existing structure which is not now wired for electric service can be wired for service during the war period if priorities are required to obtain the materials. For instance, priorities will not be granted to wire an attic or playroom in a residence, nor to wire a farmhouse so that the farmer may tap the rural line already in place or being built to serve a war load.

The division also is refusing priority assistance for repair or maintenance of a residential lighting circuit where another lighting circuit is still functioning in the same house. Only exception to this rule is instances where fire hazards can be shown.

The division's policy was enunciated because of many PD-1A applications for priority assistance on jobs which fall outside the limitations now in effect.



**OFFICIALS PRESENT** at the opening session of the Tennessee Electrical Contractors Association Convention at Chattanooga include (L to R) C. R. Wright, Knoxville, retiring president; F. H. Sweet, Chattanooga, secretary-treasurer; Mayor E. D. Bass of Chattanooga; and D. B. Clayton, Birmingham, Ala., NECA committeeman.

### MINNESOTA HOLDS "VICTORY" MEETINGS

The electrical industry in the rural areas of the State of Minnesota is being kept abreast of the latest developments on priorities and price regulations as well as other important industry problems of the day. This information is being presented through a series of "Power for Victory" meetings conducted under the joint sponsorship of the North Central Electrical Industries, the State Board of Electricity and the North Central Electric Association, with the cooperation of REA project superintendents and Municipal Utilities. These gatherings are held in various parts of

the state at the rate of at least one each week.

The program for the meetings is limited to a discussion of the following subjects: Basic Priority Regulations Affecting the Electrical Industry; Safety and Accident Prevention; Conservation of Critical Materials and Use of Approved Substitutes; Price Regulatory Measures and Customer Service on Electric Appliances.

Local committees make the arrangements for the meetings and the subjects are presented and discussed by William A. Ritt and A. H. Kessler of the N.C.E.I.; George Garney, executive secretary, State Board of Electricity; Glenn Rowell, electrical engineer, Underwriters Inspection Bureau, Minneapolis; and John Lapham, secretary-manager, North Central Electric Association. Meetings have been held at Jordan, St. James, Fairbault, Winona and St. Cloud. Others are planned.

#### COMING MEETINGS

**National Electrical Contractors Association**—Annual Convention, Bigwin Inn, Lake of Bays, Ontario, Aug. 31-Sept. 5.

**International Association of Electrical Inspectors**—Northwestern Section, Portland, Oregon Sept. 14-16. Southwestern Section, Fresno, Cal., Sept. 21-23. Western Section, Book-Cadillac Hotel, Detroit, Mich., Oct. 5-7. Eastern Section, Hotel Taft, New Haven, Conn., Oct. 12-14. Southern Section, Richmond, Va., Oct. 19-21.

**International Association of Electrical Leagues**—Seventh Annual Conference, Hotel Cleveland, Cleveland, Ohio, Sept. 17-19.

**Illuminating Engineering Society**—Wartime Lighting Conference, St. Louis, Mo., Sept. 21-22.

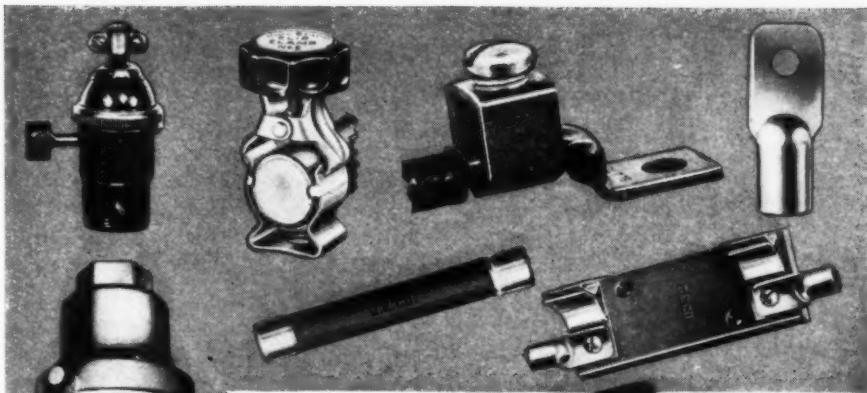
**National Electrical Manufacturers Association**—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Oct. 26-30.

#### APPOINT NFPA EMERGENCY COMMITTEE

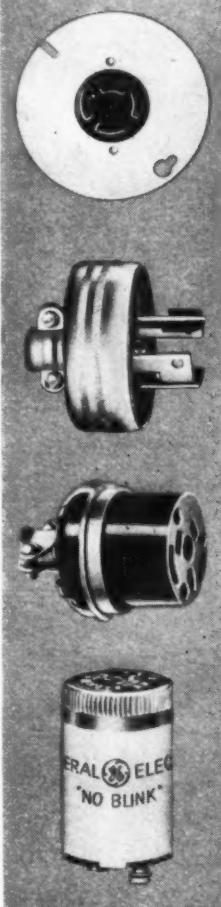
The formation of a special emergency committee of the Electrical Committee, NFPA, to function for the duration, was recently approved by letter ballot of the whole Electrical Committee membership, and by the Board of Directors of the National Fire Prevention Association, the sponsor of the National Electrical Code.

This special committee is authorized with the power to take such action in the name of the Electrical Committee as it may deem warranted by the present emergency; such action as may be taken to be published in the name of the Electrical Committee and to remain in effect until the next following meeting of the Electrical Committee.

The following comprise the personnel of this special emergency committee: Alva Small, chairman; Victor H. Tous-



## G-E WIRING DEVICES TO AID FACTORY WAR PRODUCTION



G-E Wiring Devices for new wiring and maintenance will give dependable service in war projects of all kinds — factories, mines, power houses, warehouses, etc. The G-E line includes different kinds and sizes of switches, lampholders, sockets, outlets, caps, connector bodies, fluorescent starters, cable terminals, fuses, fuse cutouts, etc. These devices are high quality and are made according to rigid specifications. G-E fluorescent starters have won wide user acceptance.

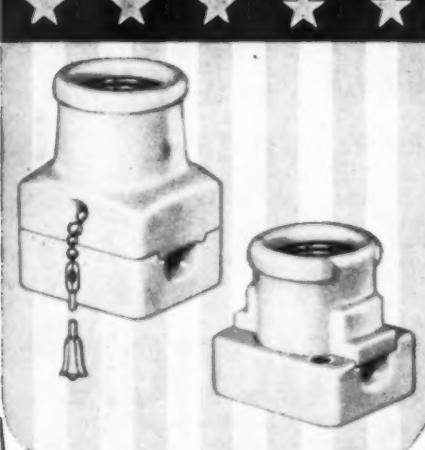
You are sure to find suitable G-E Wiring Devices for your particular needs. G-E Distributors are located at key points all over the country. For further information see the nearest G-E Merchandise Distributor or write to Section D821-8, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

**GENERAL**  **ELECTRIC**

# P&S

WIRING DEVICES

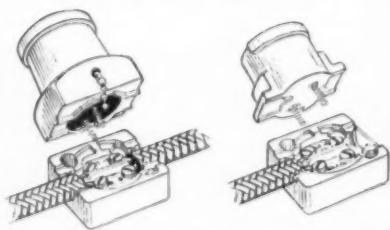
## CONSERVE CRITICAL MATERIALS



No. 1701

No. 1700

**Designed for today's market—  
New two-piece porcelain  
cablettes—for use with non-  
metallic sheathed cable. Install  
directly on surface—no boxes,  
clamps, connectors or soldering.  
Easy to wire and assemble.**



**Send for your copy of our new  
Catalog**

**Sold through  
Electrical Wholesalers**

**Pass & Seymour, Inc.  
SYRACUSE, N.Y.**

*In the News*

[FROM PAGE 93]

ley, secretary; L. F. Adams, George Andrae; E. A. Brand; M. M. Brandon; Paul Ferneding; R. L. Lloyd; J. D. Lynett; W. J. Mahan; and A. H. Schirmer.

### NATIONAL CODE RULES ALTERED

Several amendments to the National Electrical Code for the duration of the war have been announced. The text of the revisions are as follows:

Interim Amendment No. 50. Amend table 4 as follows:

Conductor	Size of Conductors in a Conduit	Number	Change From	To
4	1	3/4	1/2	1/2
400,000	1	1 1/4	1 1/2	1 1/2
10	2	3/4	1/2	1/2
2	3	1 1/2	1 1/4	1 1/4
4/0	3	2 1/2	2	2
300,000	3	3	2 1/2	2 1/2
900,000	5	New 5		
1,250,000	5	New 6		
700,000	6	New 5		
1,000,000	6	New 6		
10	7	1 1/4	1	1
300,000	7	New 4		
450,000	7	New 4 1/2		
550,000	7	New 5		
900,000	7	New 6		
250,000	8	New 4		
350,000	8	New 4 1/2		
500,000	8	New 5		
750,000	8	New 6		
300,000	9	New 4 1/2		
400,000	9	New 5		
700,000	9	New 6		

Interim Amendment No. 51. Revise Section 3488 of the 1940 edition of the National Electrical Code so that it will read: "Threads. Tubing shall not be coupled together nor connected to boxes, fittings, or cabinets by means of threads in the wall of the tubing, except by fittings approved for the purpose. Threads shall not be of the standard pipe thread dimensions."

Also revise Section 93481 of Chapter 9 of the 1940 edition of the Code (page 290) by inserting a new sub-paragraph to read as follows: "a. Threads. When the tubing is coupled together by threads, the connector shall be so designed as to prevent bending of the tubing at any part of the thread."

Interim Amendment No. 52. Section 2523—amend this Section so that it shall read: "2523. Grounding Connection for Alternate-Current Systems: Secondary alternating-current circuits which are grounded shall have a grounding connection at each individual service, except as provided for in Section 2521. The connection shall be made on the supply side of the service disconnecting means. Each secondary distribution system which is grounded shall have at least one additional

grounding connection at the transformer or elsewhere. No grounding connection shall be made to the grounded circuit conductor on the load side of the service disconnecting means, except as provided for in Section 2524."

Interim Amendment No. 54. Renumbering and Amendment of Text of Section 2559. Rerun this section to be 2560 and substitute the following text: "2560. Grounding Equipment to Circuit Conductor: The grounded service conductor on the supply side of the service disconnecting means may be used for grounding meter housing and service equipment. The grounded circuit conductor on the load side of the service disconnecting means shall not be used for grounding equipment, cable armor, or metal raceways except as provided for in paragraph (c) of Section 2556 and Section 2559."

Interim Amendment No. 55. Section 2572. Means of Assuring Continuity: The Article Committee proposes a new subparagraph to read: "Bonding equipment to the grounded service conductor in a manner provided in Section 2613."

Interim Amendment No. 56. A new note to follow Section 4006, Minimum Size of Flexible Cord. Insert the following War Emergency Note after the present text of 4006: "To assist in conserving copper and rubber, and for the duration of the Emergency, flexible cords of No. 20 gage may be used for the applications permitted for Type PO-64 cord by note 2 (on page 332)."

### RHODE ISLAND LAUNCHES STATE LICENSING

After several years of long arduous struggles, with interim disappointments and failure, on the part of the electrical industry of Rhode Island, state licensing of electricians became a reality when Governor J. Howard McGrath of Rhode Island signed the bill that created a State Board of Examiners of Electricians; and provided for the licensing of any person, firm or corporation which enters into, engages in, or works at the business of installing wires, conduits, apparatus, fixtures or other appliances for carrying or using electricity, either as a contractor or as a journeyman electrician. After July 1, 1942 anyone in the above category must possess a license to do work in this field.

Persons, firms or corporations engaged in the electrical business for five years prior to passage of the legislation will not be required to pass any examination, provided they apply to the board for a license within one year from the passage of the act and they can prove fitness to conduct such an electrical enterprise.

The bill provides for a Board of Examiners to be appointed by the governor and comprising the following:

1. A member of an electrical inspection department of any city or town with at least five years experience as an electrical inspector. He will represent the people and will be appointed for one year.
2. An electrical contractor who will represent the employer—appointed for two years.
3. A journeyman electrician who will represent labor—appointed for three years.
4. A qualified employee of a utility com-

pany, who will represent the utilities—appointed for four years.

5. The Superintendent of State Police—as an ex-officio member.

Members of the Board appointed by the Governor include the following: James F. Burns, Jr., Providence contractor, chairman; Peter J. Hicks, Providence inspector, secretary; Thomas Kearney, Business Agent, Local 99, IBEW; William O'Neil, Blackstone Valley Gas & Electric Co.; and Superintendent of State Police Edward J. Kelly, member ex-officio. The Board members, now functioning in their new office at the State House in Providence, are reimbursed \$10 per day for actual service at meetings, provided the total compensation per member per year does not exceed the sum of \$200. All expenses, including a secretary and clerical help are to be paid out of the fees—the balance to be returned to the State Treasury for general use.

The new law provides for three separate types of licenses and fees: Class A—for contractors, costing \$25; Class B—for electrical journeymen, costing \$5; Class C—for firms or corporations for on the premise work (concerns with their own electrical maintenance men), costing \$1. All licenses are renewable annually. The examinations for licenses will consist of testing the applicant's knowledge of the National Electrical Code and practical electrical work.

The Rhode Island law and its provisions for licensing follow closely the pattern of the law which has been so successful in Massachusetts. The only exception is the Class C license, which apparently is covered in very few, if any, state licensing laws and is a pioneer venture on the part of the Rhode Island group.

### TRI-CITIES LIGHTING REFRESHER COURSE

The Electrical Institute of the Tri-Cities, embracing Rock Island and Moline, Ill., and Davenport, Iowa, sponsored a three session Refresher Program for Wartime Lighting. The three evening sessions, held on July 23, 30 and August 6 in the auditorium of the Iowa-Illinois Gas & Electric Co., Rock Island, represent one of the Institute's programs to help contribute something of value to America's War Effort.

Carl J. Frisbee, Lighting Specialist, Lamp Dept., G. E. Co., Nela Park, handled the majority of the subjects covered at the sessions. These included: The Lighting Industry Today; What We Can Do To Help Win the War; Review of Science of Seeing as Applied to War Production; Fundamentals of Illumination; Design Calculations; Characteristics of Lighting Systems for War Production; Shadows, Brightness, Maintenance, Supplemental Lights, Special Inspection Lights.

The final session was devoted to a discussion of handling the job as Wartime Lighting Counsellors and a sound movie, "How Light Can Help to Win

# Lighting THE NATION'S WAR PRODUCTION . . . Sola Transformers

for . . .

### COLD CATHODE . . .

Take these assembly lines of the Federal Electric Company, Signal Division, for instance, where dependence on reliable lighting is most forcefully demonstrated. They can't afford to take chances with their illuminating equipment. It must be as nearly 100% trouble free at all times as it is humanly possible to make it.

ask for bulletin  
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### FLUORESCENT LIGHTING

Specified and used in many important air fields and defense plants, Sola fluorescent lamp ballasts guard against untimely failures and costly production delays. Their efficiency prevents excessive drain on already overloaded supply lines. Their small size permits use of compact fixtures, releasing excess vital materials for other use. Standard or constant voltage units available in single or 2-lamp capacities.

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### MERCURY VAPOR LAMPS

The high power factor (98%+) of Sola Mercury vapor lamp transformers imposes no wattless load on power systems. Completely independent of line voltage changes, they prevent lamp outage due to line voltage drops and increase lamp life by insuring perfect lamp operation regardless of line voltage levels.

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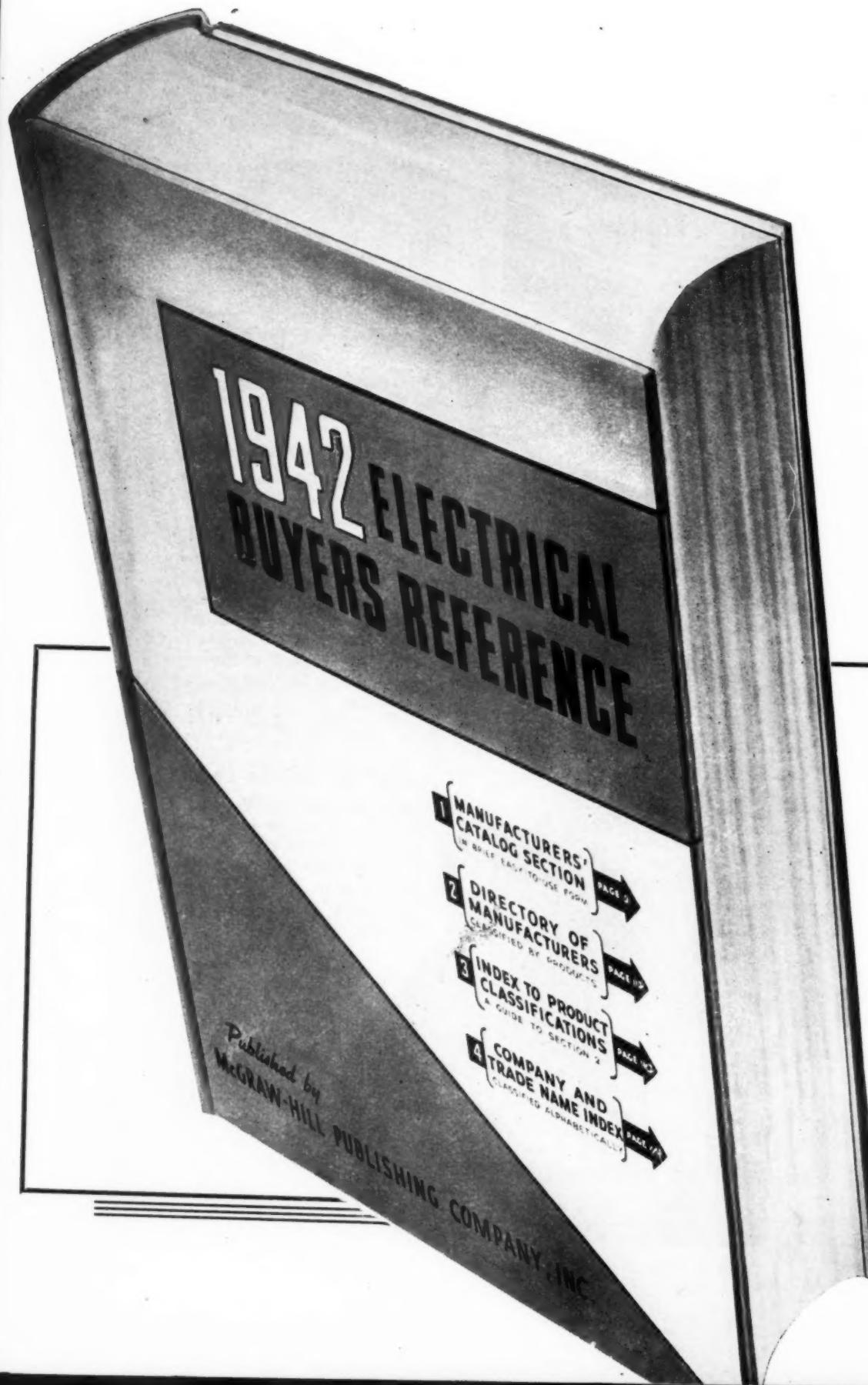


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\* A Briefalog is the modern method of cataloging—with condensed descriptions and specifications on all products—plus branch office, distributor and warehouse addresses for quick follow-through.

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ELECTRICAL BUYERS R

# **Y<sup>nd</sup> GOVERNMENT at WAR!**

If you want information on electrical products—in a hurry—keep this handy volume at your elbow. For it contains the Briefalogs\* of 224 manufacturers—product data that includes everything you need to compare, select, specify and buy!

Today, more than ever, you need up-to-date information to help you keep moving on war work. Here, in the Electrical Buyers Reference, you have all the suppliers of the products you plan to purchase. And a quick flip of the page brings you to Briefalogs of the leading manufacturers.

Use your copy of this invaluable reference volume.

It's more useful today than ever before!

Need **INSULATING MATERIALS** for example?

These manufacturers have included data on their products in the 1942 Electrical Buyers Reference:

Johns-Manville Corp.  
Star Porcelain Co.  
Mica Insulator Co.  
Acme Wire Co.  
New Jersey Wood Finishing Co.  
Biwax Corp.  
Mitchell-Rand Insulation Co.  
Zophar Mills, Inc.  
Bakelite Corp.  
Inst-X Co.

Insulation & Wires, Inc.  
Minerallac Electric Co.  
Okonite Co.  
Westinghouse Electric & Mfg. Co.  
Continental-Diamond Fibre Co.  
Formica Insulation Co.  
National Vulcanized Fibre Co.  
Synthane Corp.  
Taylor Fibre Co.  
Wilmington Fibre Specialty Co.

Brand & Co., William  
Macallen Co.  
New England Mica Co.  
Rubberoid Co.  
Owens-Corning Fiberglas Co.  
Van Cleef Bros.  
Minnesota Mining & Mfg. Co.

—and several hundred other manufacturers give data on their products in the fact-full pages of this reference.

**SWIVEL SWITCHES**

ROCKER

*Individual  
Light  
Control*

No. 1048

No. 1048B

*R.H.P.  
Motors*

The No. 1048 Rocker Swivel Switch is a single-pole switch designed for individual light control. It is a standard size, 2 1/2" wide by 4 1/2" high, and has a capacity of 15 amperes at 110 volts. The No. 1048B Rocker Swivel Switch is a double-pole switch, 2 1/2" wide by 4 1/2" high, and has a capacity of 15 amperes at 110 volts.

**ELECTRICAL DIVISION**

**MCGILL**

**MANUFACTURING CO.**

**VALPARAISO, INDIANA**



REGISTRATION

"the War" by Freeman Barnes, Illinois Dept. G. E. Co.; Metal Pickle, C. A. Naar; United Electric & Power Service Co., Davenport, Ia., gave the course which summary of the war emergency program. Other speakers included E. H. Williamson, Iowa-Illinoian Gas & Electric Co.; W. H. Nedley, president, Electrical Institute of the Tri-State and Pacific; C. J. Heetron, Illinois Dept. G. E. Co., LaVeenrodt, who conducted a quiz on War-time Lighting Conditions. Throughout the course the "Conservation Handbook on War Production Lighting" was used as a reference.

Refresher courses of instruction, placing more emphasis upon the educational and service activities of the organization, an effort to render greater assistance in the national all-out war effort.

The Agent of Business Manager E. P. Zachman was appointed and his suggested war emergency program adopted in general. The activities recommended in this program include the following:

(1) The provision of priority information and power regulation interpretation service to members.

(2) The establishment of plans for expediting services and repair of electrical appliances when required by the emergency.

(3) The establishment of plans for the quick and efficient location of electrical resources after a sudden catastrophe.

(4) Increased education of electrical maintenance techniques in emergency maintenance and production.

(5) Arrangement of facilities for electrical contractors to provide accurate services in connection with repair.

(6) Provision of accurate wiring for de-energized houses.

(7) Plans to advise industry and the public on how to use existing appliances to conserve critical materials and maintain their present degree of public acceptance.

(8) The provision of means for spreading news and information relative to the activities of the war industry.

(9) Arrangement of liaison for the post-war period.

The suggestions included recommendations to establish a national organization for electrical contractors to meet problems that might arise during the usual time that division of the association was urged to cover, and had some methods of co-operation, these objectives most important in the interests of the electrical industry. All sections will be encouraged to run smoothly operating units.

## ALLOWANCES FROZEN INCEILING PICES

According to an interpretation of the General Engineering Free Regulation, a public utility can't increase its 1939 wiring allowances by increases in its electric rates and add the special inducement or keep it unchanged a corresponding reduction in its rates.

## N.G.C. EFFECTS BUSES

The Council of Engineers of the Northern Electric Cooperative Association, Minnesota, North, re-elected H. E. Young chairman; Chester Becker, Minn., H. E. Chapman, vice-president; L. G. Johnson, treasurer; William A. Rieck, general manager. Mr. Chapman succeeds Mr. Young's who is now on active duty and is committed to U. S. Army Air Corps.

The following are members of the present Board of Directors: Manufacturers—H. H. Chapman, C. J. Piemeis; Wholesalers—D. R. Ford, L. G. Mampe; Private Utilities—H. R. Young, C. S. Kennedy; Electrical Contractors—William A. Ritl, F. M. Dripp; Electrical Dealers—C. J. Christopher, T. G. Beecher.

#### OLESON SUCCEEDS HERZBERG AS MANAGER

Walter H. Oleson, executive manager of the Heating, Piping and Air Conditioning Contractors Milwaukee Association, has been appointed manager of the Milwaukee Chapter of the National Electrical Contractors Association.

In his new connection, Mr. Oleson will be associated with E. H. Herzberg, former executive manager of the chapter, who is now executive assistant to the president, NECA, in Washington. D. C. Mr. Oleson continues his affiliation with the Heating, Piping and Air Conditioning Contractors Association.

#### CHICAGO E.W.E. ELECTS OFFICERS

Taking time off from their recent annual golf tournament, the members of the Chicago Electrical Maintenance Engineers go down to the various business offices to choose their leaders for the 1942-1943 fiscal year.

When the ballot was finally recorded, N. H. Dimus, Carnegie-Illinois Steel Co., emerged as president of the organization. John C. Howard, Standard Oil Company of Indiana, was elected vice-president. M. C. Ely continues as secretary-treasurer of the group. Members re-elected Vice-Chairmen to vacancies on the Executive Committee are Paul Antesecu, Link-Belt Company; John Howard, Standard Oil Company of Indiana; James H. Miller, Wisconsin Steel Company; and George Philip, Electric-Motive Division of General Motors.

#### MOTOR SHOPS AND THE DRAFT

The National Industrial Service Association has done three big jobs in Washington these days. The first was getting recognition for the essential functions performed by the motor service industry; the second, getting the necessary material to carry on the work; the third, and most difficult, getting the draft boards to let the industry keep enough men to do the work.

According to a recent NISA release, as the result of its War Coordination Committee work, the War Manpower Commission has sent a list of occupations which the draft boards are asked to defer so that

TYPE RW 600 V. - MOISTURE-RESISTANT GRADE

TYPE RH 600 V. - HEAT RESISTANT GRADE

TYPE RR 600 V. - DURABILITY GRADE

TYPE RM 600 V. - MOISTURE-RESISTANT GRADE

G-E  
BUILDING WIRES  
FOR  
WAR PROJECTS

#### G-E Distributors are Located at All Key Points in Country

You can obtain G-E building wire right in your own territory. Time can be saved by installing G-E building wire on urgently needed war projects, because it is easy to use—it is easy stripping, clean stripping, and easy putting.

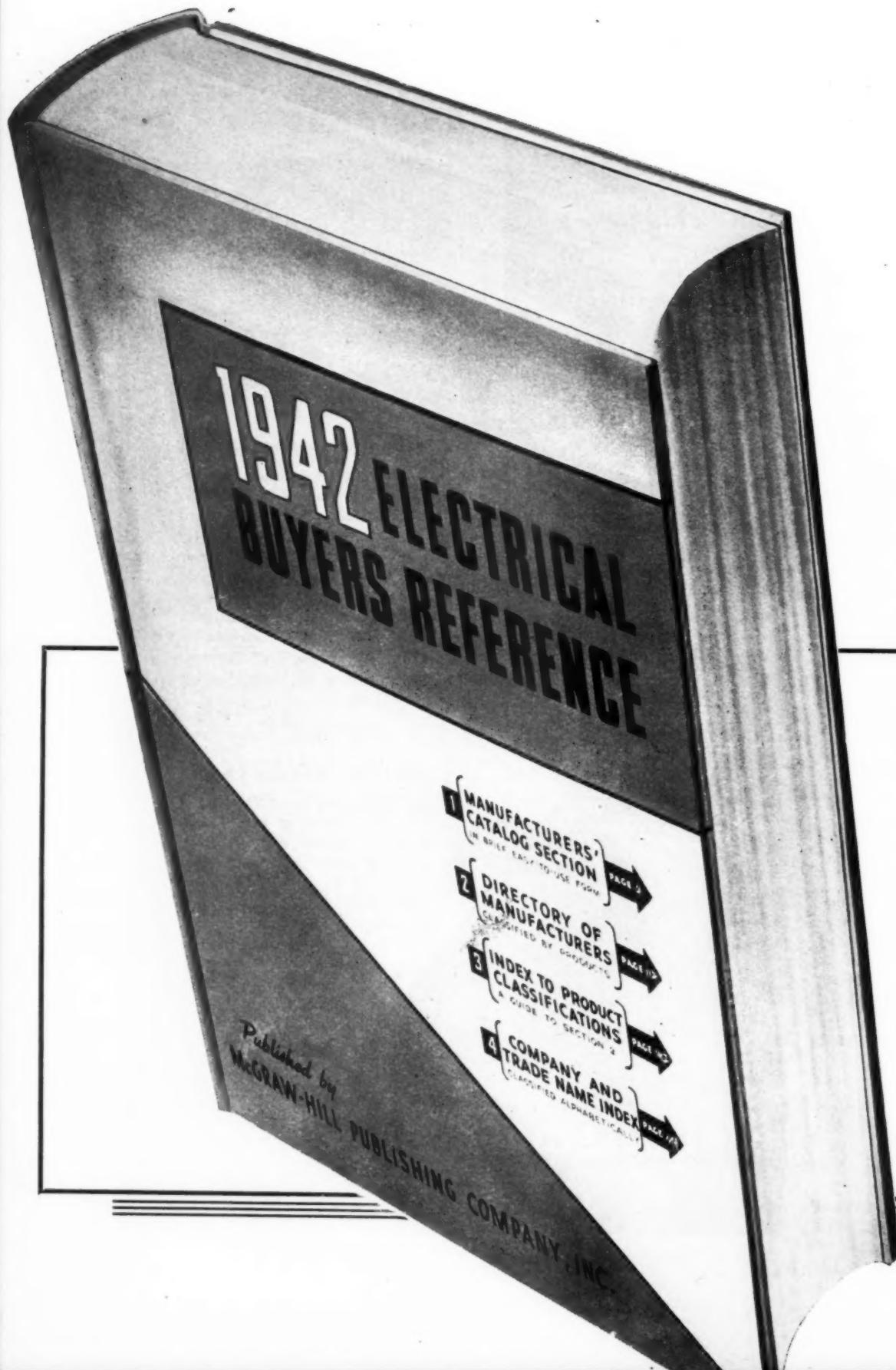
G-E building wires are high quality. Accurate centering of conductors is provided by continuous vulcanization of insulation. Four grades are available: Type RW Code grade; Type RR, Performance grade; Type RH, Heat Resistant grade; Type RM, Moisture-Resistant grade.

G-E building wire can be depended upon to give good service. For further information see the nearest G-E Merchandise Distributor or write to Section W824-88, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

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## for INDUSTRY<sup>nd</sup>



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ELECTRICAL BUYERS REF

# **nd GOVERNMENT at WAR!**

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Today, more than ever, you need up-to-date information to help you keep moving on war work. Here, in the Electrical Buyers Reference, you have *all* the suppliers of the products you plan to purchase. And a quick flip of the page brings you to Briefalogs of the leading manufacturers.

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Biwax Corp.  
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Zophar Mills, Inc.  
Bakelite Corp.  
Inst-X Co.

Insulation & Wires, Inc.  
Minerallac Electric Co.  
Okonite Co.  
Westinghouse Electric & Mfg. Co.  
Continental-Diamond Fibre Co.  
Formica Insulation Co.  
National Vulcanized Fibre Co.  
Synthane Corp.  
Taylor Fibre Co.  
Wilmington Fibre Specialty Co.

Brand & Co., William  
Macallen Co.  
New England Mica Co.  
Ruberoid Co.  
Owens-Corning Fiberglas Co.  
Van Cleef Bros.  
Minnesota Mining & Mfg. Co.

—and several hundred other manufacturers give data on their products in the fact-full pages of this reference.

## LEVOLIER SWITCHES

FOR

F.H.P.  
Motors

Individual  
Light  
Control

No. 41-B



The New No. 41-B Levolier Switch with plastic casing, steel lever, nut and chain, is a compact, sturdy, easy to wire unit. Individual Light Control makes it an ideal power saver. Economical, trouble-free.

The No. 1010 is a 10-amp., 125-volt, lever-controlled switch, and listed by the Underwriters with a "T" rating; capable of taking an initial surge of 80 amps., or 8 times its rated capacity. Dimensions,  $\frac{1}{8}$ " thick, by  $1\frac{1}{4}$ " diameter. Can be had with 7' cord, chain with bell ends or plain lever.



No. 1010

ELECTRICAL DIVISION

**MCGILL**  
MANUFACTURING CO.  
VALPARAISO, INDIANA

In the News

[FROM PAGE 95]

the War," by Freeman Barnes, Lamp Dept., G. E. Co., Nela Park. C. A. Nash United Light & Power Service Co., Davenport, Ia., closed the course with a summary of the refresher program. Other speakers included, E. T. Williamson, Iowa-Illinois Gas & Electric Co.; T. F. Kelley, president, Electrical Institute of the Tri-Cities; and Fenn. C. Horton, Lamp Dept. G. E. Co., Davenport, who conducted a quiz for Wartime Lighting Counsellors. Throughout the course, the Counsellor's Handbook on War Production Lighting was used as a reference.

### ADEQUATE WIRING BUREAU FOLDER

A folder entitled "Check Your Wiring for Wartime Service" has been issued by the National Adequate Wiring Bureau. This is the nucleus of an educational program to aid customers in overcoming the problems arising from inadequate wiring installations.

It gives the answers to six illustrated questions about the number of branch circuits in the home; correct size circuit protective devices; current-carrying capacities of branch circuits; locations of outlets served by each circuit; changing fuses, etc.

The Adequate Wiring Bureau's wartime educational program is designed to maintain the good-will of customers who must continue using inadequate wiring installations by helping them to get better service from present installations and to understand and avoid difficulties arising from overloaded circuits. At the same time, by focusing attention on these difficulties, such a program will build appreciation of the need for adequate home wiring and the desire to secure improved wiring installations, after the war.

The folder is printed in two colors and copies are available to local groups at one cent each, for minimum orders of 100 copies. To assist local groups in using this program advantageously, the Bureau has prepared Service Bulletin No. 6 containing several specific suggestions for using the booklet.

### C.E.A. MAPS WAR PROGRAM

The Board of Trustees of the Cincinnati Electrical Association unanimously voted to continue operations during the present war period. The organization, engulfing the electrical industry in one of the nation's key industrial cities, adopted a somewhat

different pattern of operation, placing more emphasis upon the educational and service activities of the group in an effort to render a direct service in the nation's all-out war program.

The report of Business Manager E. P. Zachman was approved and the suggested war operating program endorsed in general. The activities encompassed in this program include the following:

1. The provision of priority information and price regulation interpretation service to members.

2. The development of plans for expediting service and repairs of electrical appliances for the duration of the emergency.

3. The development of plans for the quick and efficient pooling of electrical resources in case of a serious catastrophe.

4. Increased education of electrical maintenance engineers on emergency maintenance for production.

5. Arrangement of facilities for electrical contractors to provide adequate services in domestic repairs.

6. Promotion of adequate wiring for defense housing.

7. Plans to advise industry and the public on how to use existing appliances to conserve critical materials and maintain their present degree of public acceptance.

8. The provision of means for spreading news and information relative to the activities of the local industry.

9. Development of plans for the post-war period.

The suggestions included recommendations to maintain a flexible organization for quick adjustment to new problems that might arise during these unusual times. Each division of the association was urged to develop plans and devise methods of accomplishing those objectives most important to its particular branch of the electrical industry. All activities will then be coordinated into a smoothly operating unit.

### ALLOWANCES FROZEN IN CEILING PRICES

According to an interpretation of the General Maximum Price Regulation, a public utility which had offered a \$30 wiring allowance on purchases of an electric range and withdrew the special inducement on May 31 must make a corresponding reduction in the price of the ranges.

### N.C.E.I. ELECTS OFFICERS

The Board of Directors of the North Central Electrical Industries, Minneapolis, Minn., re-elected H. E. Young as chairman. Other officers include, H. H. Chapman, vice president; L. G. Mampie, treasurer; William A. Ritt, secretary-manager. Mr. Chapman succeeds M. C. Baich who is now on active duty as a captain in the U. S. Army Air Corps.

Electrical Contracting, August 1942

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RW 600 V-- MOISTURE-RESISTANT GRADE  
RH 600 V-- HEAT RESISTANT GRADE  
P 600 V-- PERFORMANCE GRADE  
RR 600 V-- CODE GRADE

WIRES FOR  
EVERY PURPOSE

# G-E BUILDING WIRES FOR WAR PROJECTS

#### G-E Distributors are Located at All Key Points in Country

You can obtain G-E building wire right in your own territory. Time can be saved by installing G-E building wire on urgently needed war projects, because it is easy to use. It is easy stripping, clean stripping and easy pulling.

G-E building wires are high quality. Accurate centering of conductors is provided by continuous vulcanization of insulation. Four grades are available: Type R, Code grade; Type RP, Performance grade; Type RH, Heat Resistant grade; Type RW, Moisture Resistant grade.

G-E building wire can be depended upon to give good service. For further information see the nearest G-E Merchandise Distributor or write to Section W821-8, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

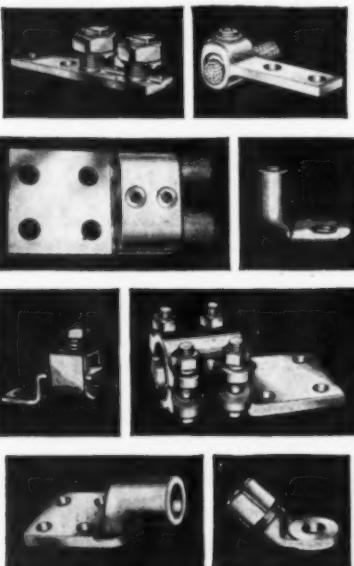
GENERAL  ELECTRIC

"To get the  
**RIGHT lug**  
at every point—



### —select your terminals from the **COMPLETE** line"

Look in the Penn-Union Catalog—all of the good types: Solderless lugs to grip the conductor by Bolt, Screw, Post-and-Nut, or Multi-Slit Tapered Sleeve . . . Soldering lugs, Cast and Stamped, in wide variety . . . Here are just a few:



You will also find the most complete line of Cable Taps, Tee Connectors . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Service Connectors.

Penn-Union fittings are preferred because every one is mechanically and electrically dependable. They are the first choice of leading utilities, industrials, electrical manufacturers, contractors. Write for the Penn-Union Catalog.

**PENN-UNION**  
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ERIE, PA. Sold by Leading Jobbers

**PENN-UNION**  
Conductor Fittings

## In the News

[FROM PAGE 99]

such workers may remain in essential war work on the home front. This list of critical shortage occupations includes:

- Armature winder—all-around
- Coil assembler—electric
- Coil winder—production
- Inspector—electrical
- Machinist—all-around
- Electrical assembler
- Electrical tester—power equipment
- Foreman—machine shop
- Machinist—bench

NISA has also been advised by the Manpower Commission that more sympathetic consideration might be given for deferment appeals, if each company would classify all its employees for the benefit of the draft board, instead of presenting individual cases. In presenting such classifications the following information should be given:

1. A description of each man's job or function
2. How much training it takes to reach a minimum required proficiency
3. How much training has been given and what has been done towards getting replacements
4. How much training has been given to different individuals for better or more responsible positions.

The above suggestions do not infer that there will be any blanket deferments, for the decision in each individual case still rests with the local draft boards. However, presentation of the above classifications will tend to lighten the load of the boards and help them in reaching a fair decision.

### NEW EAST AND WEST NISA GROUPS

In its latest drive for membership the National Industrial Service Association has gained two new chapters.

The first is in San Francisco where 17 members of a motor shop group joined NISA as the Bay Cities Chapter. K. M. Ryals is secretary of the group. The second group is in Bluefield, West Virginia, where J. W. Overstreet of National Coil, announced that shops who were not already members would soon be in the NISA fold.

### BOOK REVIEWS

#### Fluorescent Lighting Manual

The Fluorescent Lighting Manual is a new book covering the field of fluorescent lighting for everyone concerned with the design, installation, servicing or selling of fluorescent equipment.

The manual is one of those "must" books that will find a welcome on the most cluttered desk of busy lighting men. Written by Charles L. Amick from the engineering resources of the Nela Park Engineering Department of the General Electric Co., it is a practical "how-to-do-it" treatment of

the field of fluorescent lighting design and application.

The author tackles fundamentals first in a chapter on fluorescent lamps and their characteristics followed by a discussion of auxiliary equipment. Operating characteristics, installation hints and service suggestions are chapters that deal directly with the everyday problems of contractors and maintenance men.

For those concerned with lighting system design there are chapters on luminaire selection and layout and for those who sell a chapter on lighting economies.

An appendix gives useful tables for line current calculations, recommended levels of illumination and coefficients of utilization.

Fluorescent Lighting Manual, by Charles L. Amick, Nela Park Engineering Department, General Electric Co., 312 pages, cloth bound. Price \$3.00. Published by McGraw-Hill Book Company, 330 West 42nd Street, New York, N. Y.

## Priorities

### WPB SPECIFIES WIRE FOR MILITARY USE

All war agencies, including the Army, Navy and Maritime Commission, are now required to use the War Production Board specifications for insulated wire and cable, along with all non-military users who have been limited to the wartime types since April. The move was ordered in a revision of Order M-15-b-1 which also makes some alterations tightening up the specifications previously in effect. Estimates are that the new program will save an additional 150 to 200 tons of crude rubber monthly.

The new specifications, generally speaking, reduce the amount of reclaimed rubber permitted in insulations. Type A insulation, for instance, may now contain only 10 percent reclaim, type B, 15 per cent; type C, 55 per cent; in each instance the rubber content is unchanged. Jackets are allowed only 50 per cent crude rubber, instead of 80 per cent, but the reclaim allowance is increased from 35 to 75 per cent. Cable, which was permitted 80 per cent reclaim with no crude, now can have only 30 per cent reclaim.

Jackets are disallowed in the new program for the three-conductor type POE-32 cord in heating pads and control switches.

### END-USE MUST SHOW ON COPPER ORDERS

Under the Allocation Classification System purchasers of copper castings will designate the end-use of the materials they order.

It was explained that end-use is a very important consideration. Although an order carries a low rating, it may be vital to the war program. Therefore it is important that certain orders bearing preference ratings lower than A-1-k be received and be reported to WPB for possible au-

thorization. Listed below are end-uses for which the Copper Branch will seriously consider authorizing copper if the orders should bear a rating lower than A-1-k.

1. Railroads
2. Streetcars
3. Buses
4. Public utilities
5. Maintenance and repair of essential industrial equipment
6. Mines
7. Petroleum industry
8. Waterworks
9. Hospitals and health supplies
10. Maintenance and repair of schools
11. Textile industries engaged in production of material for Army or Navy use
12. Defense housing (critical list) in specific areas designated by the Building and Material Branch as being essential for war purposes.
13. Fire-fighting equipment
14. Essential repair for farm machinery
15. Essential repair for elevators
16. Essential repair for food preservation machinery and dairy equipment
17. Essential parts for road-building equipment.

#### STANDARD ELECTRICAL EQUIPMENT FOR MACHINE TOOLS

In a move to speed the manufacture of machine tools, the War Production Board has prohibited production of tools calling for special electrical specifications after July 15.

Special electrical specifications include non-standardized types of electrical controls, motors, and other equipment not normally used by machine tool makers. They also include methods of attachment of such appliances which represent departures from the usual technical practices.

With certain exceptions, machine tool builders in the future will comply with machine tool electrical specifications recently established by the American Standards Association and known as American War Standard Machine Tool Electrical Standards-C74-1942. The standard was developed by the National Tool Builders



VARNISH TOPICS are expounded by H. L. Hazelton, (left) insulation engineer for Sterling Varnish Co., Hayesville, Pa. Interested listeners are Geo. P. Svendsen, (center) Boustead Electric & Mfg. Co., Minneapolis, Minn., and D. F. Alexander, western sales manager of the Sterling Varnish Co.



NATURE MAKES  
BOMBING RAIDS  
WITH LIGHTNING-

BUT YOU CAN  
PROTECT  
VITAL WAR  
PRODUCTION  
AGAINST THIS HAZARD

★ Protection of vital war production against accident and sabotage is an important consideration today.

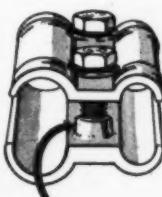
Lightning is Nature's bombing weapon. It can act either as a demolition or an incendiary bomb—can result in disastrous loss and delay.

That is why West Dodd Lightning Protection and static control equipment is being widely used on Army Ordnance Plants. Helping protect ammunition loading lines, standard magazines, underground magazines and bag loading buildings. That is also why many important industrial plants have West Dodd protection on power stacks.

#### TWO IMPORTANT FACTORS

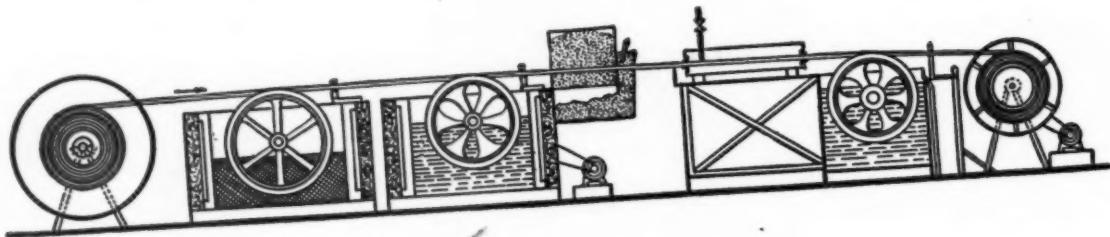
The 12 old line companies, including the famous Dodd & Struthers Company, pioneer of modern approved lightning protection, are consolidated in West Dodd. This wealth of experience in building and installing lightning protection, and a long proved record of responsibility, are two important factors in your choice of such equipment.

The exclusive, West Dodd, easy-on, solderless bonding clamp. Eliminates hand-wrapping and soldering. Quicker to install. More permanent. Better electrical bond. Made of copper-bronze, tinned where necessary to prevent electrolytic corrosion. Note how boss provides greater number of threads to practically eliminate screw slippage. Sixteen different sizes carried in stock.



**WEST DODD**  
LIGHTNING CONDUCTOR CORP.  
GOSHEN, INDIANA

# WAR is engineered scrap →



This war machine was built from an old pulley, the rear wheels of a truck and odds and ends of sheet steel.

It will never fire a projectile nor drop a bomb. But if our enemies really understood America it would frighten them.

The function of this scrappy gadget is to renew the weather-proofing on electric power wire . . . wire that would otherwise have to be junked.

► But war teaches us to look beyond machines to the hearts and minds of the men who make them.

In such perspective the device shown above takes on deep significance. It becomes a mechanical parable on the ingenuity of men whose job it is to keep electric power flowing to the vital war industries, regardless of shortages of copper, steel, rubber, aluminum.

► There are hundreds of such parables in every war-converted industry. Here are just a few from our great electric power plants:

. . . tons of bolts are being saved by a new method of rigging crossarms on electric poles.

. . . a southern generating station found its dam weakening. To keep the power flowing, holes were bored through the concrete and the dam bolted to bedrock!

. . . to avoid a shutdown, a middle-Atlantic utility worked out a method of stopping leaks around the giant valves controlling its water supply by mixing sawdust with the water. It worked.

. . . a western company bought old suspension cables from the wrecked Tacoma Bridge, untwisted them and used the metal as concrete reinforcement.

So goes the saga of electric power, as the industry does its share in the common task . . . With much of its trained man-power in the services, with priorities available only in the most urgent cases, the American utilities are showing the stuff American management and labor are made of.

But where are the stories of plants rushed into being almost overnight to supply electric energy?

As an American, you can thank your lucky stars such stories are few. Generating plants and power lines take years to build. For instance, our country's power equipment at the start of the war represented an investment of more than the present combined cost of the two-ocean navy and lend-lease expenditures.

War conversion for this vigorous industry was almost as simple as pushing the light switch on your reading lamp. The power was there because energetic managements had created it in the normal course of American life.

Some rush construction was necessary, but the electric power industry was first in war because it had been first in peace.

► The story goes back to the depression years. The utilities were the first to shake off the doldrums. By 1935, they had already passed 1929 levels.

. . . By the time the war broke out in Europe, America's giant electrical capacity surpassed that of any combination of potential enemies.

. . . It has grown since then, with 3½ million kw. capacity scheduled to be added in 1942. This year, the industry also will spend 150 million dollars on maintenance alone.

► Because of these private expenditures, because the electrical companies started years ago to sell women on the convenience of electrical home appliances . . . and because the industry has always built in advance of demand, it was ready for either peace or war, with the world's greatest system of power production and distribution.

\* \* \*

In recognition of the miracle of war production—accomplished through the cooperation of American management and labor with the W. P. B. . . . this advertisement is published by the McGraw-Hill Network of Industrial Communication.

McGRAW-HILL PUBLISHING COMPANY, Inc.

NEW YORK



# WITH A POSTSCRIPT FOR BUSINESS EXECUTIVES

PERHAPS you saw the advertisement on the opposite page, in the newspapers.

Did you notice those five examples of the way in which maintenance men are meeting the problem of war operation?

That's what this page is about.

If one public utility maintenance man works out a new way of reconditioning wire, his idea becomes really valuable to the country when all maintenance men with a similar problem find out how he did it.

If one man experiments with silver and bismuth as a substitute for tin solder, that becomes great news for a man who needs tin solder and can't get it.

That's why industry after industry has been able to meet the war production challenge . . . by swapping ideas.

► In industry, this idea swapping is done mostly through the editorial and advertising pages of the industrial press.

McGraw-Hill, for instance, keeps 153 editors and 725 engineer-correspondents busy digging up new methods of doing things.

Industrial advertisers, too, often send men

into the field to discover new ways of making their products do more work, or last longer.

When such practical editorial and advertising information is distributed to the readers of the 23 McGraw-Hill publications, the value of each idea is multiplied by thousands.

So valuable is this interchange of technical information that many companies are surveying their organizations to make sure that the supply of Industrial Magazines is adequate.

► If you would like suggestions as to how to conduct such a survey, just write to Reading Counselor Department, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York.

\* \* \*

#### THE McGRAW-HILL NETWORK

More than 1,000,000 of the executives, designers and production men, who give America her world supremacy in technical "know-how", use the editorial and advertising content of the 23 McGraw-Hill publications as a means of exchanging ideas.

#### THE McGRAW-HILL BOOKS

Technical, engineering and business books for colleges, schools, and for business and industrial use.

#### McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET • NEW YORK

#### THE McGRAW-HILL NETWORK OF INDUSTRIAL PUBLICATIONS

American Machinist  
Aviation  
Bus Transportation  
Business Week  
Chemical & Metallurgical Engineering

Coal Age  
Construction Methods  
Electrical Contracting  
Electrical Merchandising  
Electrical West  
Electrical World

Electronics  
Engineering & Mining Journal  
E. & M. J. Metal and Mineral Markets  
Engineering News-Record  
Factory Management & Maintenance  
Food Industries

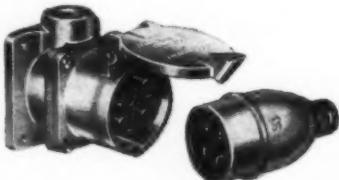
Mill Supplies  
Power  
Product Engineering  
Textile World  
Transit Journal  
Wholesaler's Salesman

# PLUGS and RECEPTACLES

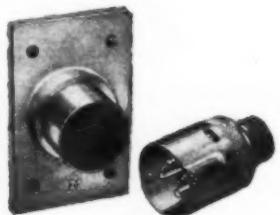
Dependable service is built into Pyle-National plugs and receptacles—with full bakelite insulation, protected contacts, and heavy steel or cast metal housings. They are proving their extra value on thousands of tough jobs. The complete line allows you to choose the correct type for use with any portable electrical equipment, signal and control circuits, pyrometers, extension lights, high frequency tools, welders, battery chargers, and similar equipment.



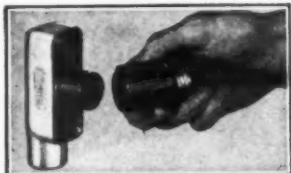
**General Purpose** plugs and receptacles: 1, 2, 3, 4, 5 poles, ratings 30, 60, 100, 200 amperes. Round prong contacts, rugged cast metal housings to withstand severe service.



**QuelArc** circuit breaking types; 2, 3, 4 wire types, ratings up to 200 amperes. Exceptional protection to contacts, for safe use as current rupturing devices.



**Triploc and Multiple Circuit** plugs and receptacles; 1, 2, 3, 4, 6, and 8 pole contact units, allowing assembly in combinations up to 32 poles. Manual and automatic release features. Ideal for portable tools, pyrometers, signal and control circuits.



**Midget Triploc**, compact, but with many exclusive heavy duty features for dependable service under severe conditions; 2, 3, 4 pole types.

Write for your copy of Pyle Catalog 1100 with complete listings of all types.

**The Pyle-National Company**  
1344 N. Kostner Ave. • Chicago, Ill.

## In the News

[FROM PAGE 101]

Association, which requested the American Standards Association to carry it through the ASA Emergency Procedure. Electrical equipment manufacturers, machine tool builders, and users of machine tools, together with representatives of ASA committees on the National Electrical Code, Rotating Electrical Machinery, Electrical Industrial Control Apparatus, etc., were brought together and agreement reached on the final standard.

### P-19 ORDERS RESTRICTED

Builders with project ratings under Order P-19 are restricted in their use of the ratings in Amendment 1. The order as originally issued did not limit types of material builders could obtain for war construction projects.

The amendment limits builders to materials which are to be physically incorporated in the projects and to certain "expendable material" consumed in construction operations.

### CONTRACTORS MAY HANDLE POWER EQUIPMENT

Limitation Order L-117 was amended today so that contractors engaged in the construction of industrial plants may obtain delivery of heavy power and steam equipment to be used in such plants by extending preference rating certificates on orders issued to the persons for whom such plants are being constructed. Heretofore, Order L-117 permitted heavy power and steam equipment to be delivered only to the person to whom a preference rating certificate or order was originally issued.

### FROZEN STOCKS RELEASED

Stocks frozen in the store rooms of firms which cannot use such materials in their business may now be disposed of through certain restricted channels under Priorities Regulation No. 13.

Limitation orders, issued by WPB in anticipation of industrial conversion to war production, and to conserve scarce materials, contain various provisions which restricted disposal of inventories frozen as a result of their terms. In some cases, certain permitted types of sales were listed in the original order. In other cases, no sale might be made without application to Washington and the specific authorization of the Director of Industry Operations. These restrictions are now replaced by the

conditions established in the new regulation, which controls all sales of restricted material including those sold in liquidation and bankruptcy proceedings.

In general these stocks may be sold "upstream" to original manufacturers or to firms with the necessary preference rating or allocation certificate.

### CHECK BACK ON PD-1A REQUESTS

A new service for applicants for priority assistance who use individual PD-1A certificates has been announced by J. S. Knowlson, Director of Industry Operations.

If applicants will enclose with their application blank a self-addressed post card, the case number assigned to their application will be stamped on the card, and it will be returned to them to facilitate handling of subsequent inquiries with respect to the application. All inquiries concerning applications should be submitted in writing.

In order to avoid unnecessary correspondence, applicants are requested not to make inquiries concerning their cases for two weeks after they have been received by WPB. This is the maximum time normally required to process an application, and usually the application will either be granted or denied in a short time. If there is a delay beyond two weeks, or if for any reason supplementary information is submitted, use of the case number in correspondence will expedite handling and assure a prompt reply.

### — WITH THE — *Manufacturers*

#### General Electric Changes

Frank G. Vaughan, former manager of General Electric's Meter Division and widely known in the electrical industry, retired on July 1 after more than 50 years with the company. He will continue to serve the division as a consultant with headquarters in Schenectady.

William F. Howe has been appointed manager of the Meter Division, succeeding Mr. Vaughan. Richard Cutts, Jr., has been named as assistant to Mr. Howe. Both Mr. Howe and Mr. Cutts will have their offices at the G-E West Lynn, Mass., works.

Walter M. Boland has been appointed Western regional sales manager of the Receiver Division of the General Electric Radio, Television and Electronics Department. He will continue to make his headquarters in San Francisco. Mr. Boland replaces Henry A. Crossland who has been transferred east to engage



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in special war production work for G-E. R. J. Bahr has been named purchasing agent for the G-E Radio, Television and Electronics Department and will have his headquarters at Schenectady.

#### Cutler-Hammer Changes

The Philadelphia District Office of Cutler-Hammer, Inc., located at 401 North Broad Street, announces the addition of R. Keeler to its sales staff.

J. E. McSorley has been added to the staff of the Cincinnati District Office.

J. A. Darnall has been added to the New York District Office, located at 8 West 40th Street.

T. N. Bristow has been made district manager of the Seattle Office.

#### Graybar Appointments

On July 1 George J. Cossmann assumed the duties of assistant district manager of the Graybar Electric Company's Central District with headquarters in Chicago.

T. H. Beecher became manager of Graybar's Indianapolis office, succeeding A. J. Callaway, who has been appointed a Major in the Air Force.

The Essex Wire Corporation of Detroit, Mich., has announced the election of Howard E. Eagleston as vice-president of Essex Wire Corp., Paranite Wire & Cable Corp., Jonesboro, Ind., and R. B. M. Manufacturing Company, Logansport, Ind.

Mr. Eagleston is in charge of the Governmental Relation Department with offices in the Shoreham Building, Washington, D. C. He was formerly connected with the General Cable Corporation of New York City.

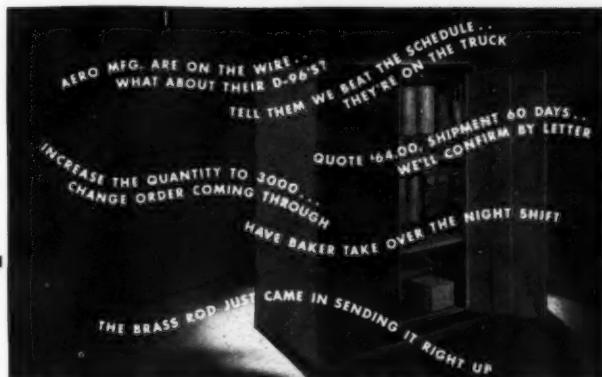


EAGLESTON

The Trumbull Electric Mfg. Co. of Plainville, Conn., has appointed H. S. "Stu" Farmilo as field representative, with headquarters in Baltimore, where he will work with Wm. J. Batchler.

Square D Company has opened a branch office at 146 Chestnut Street, Springfield, Mass., with C. T. Nash in charge. Mr. Nash previously has been in Square D's New York office.

Schwarze Electric Company, Adrian, Mich., announces that H. O. Woods has been placed in charge of all sales activities including the development of a permanent sales policy.



#### IT WORKS WONDERS . . . for War Production Plants

It's a P-A-X switchboard—heart of the private automatic telephone system. Hundreds of messages speed over P-A-X lines every day in many war plants—large and small—helping to conserve vital production time, saving countless steps, reducing errors, and cutting out hours of wasteful waiting.

#### Here's How You Can Help Your Customers Speed

**Their War Production**—Many of your customers are engaged in vital war work. The ability of P-A-X Automatic Telephones to speed up their production may enable them to obtain the high priority necessary for us to supply them. Ask your electrical wholesaler to work with you in presenting the P-A-X story; or, write us direct.

**AUTOMATIC ELECTRIC**

**PRIVATE INTERIOR TELEPHONE SYSTEMS**

Distributed by: American Automatic Electric Sales Company, 1033 W. Van Buren Street, Chicago, Ill. Sales and Service Offices in Central Cities. In Canada: Canadian Telephones and Supplies, Ltd., Toronto, Ontario

## SIMPLEX CABLE REELS

**A - W - O - L**

Thousands of Simplex reels have gone out with cables and might have been returned for credit but they have failed to get back. Many of them would be entirely suitable for use again if we could get them.

Reels are needed now for the enormous quantities of cables that must be shipped and new reels are hard to get because of scarcity of lumber and labor.

**- - - KEEP 'EM ROLLING - - -**

**PLEASE RETURN EMPTY CABLE REELS PROMPTLY**

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

**Simplex**  
WIRES and CABLES

# It's LIGHT OUTPUT not BLACKOUT that'll win the Battle of Production



Providing light under which eyes can see without stress or strain is a major step to quicker production, better production. Practical production men realize it's just as important to have good lighting at the machine to minimize rejects as at the inspection benches to find sub-standard work. So, check up on light output, and as you plan for better lighting, keep Acme performance in mind. Acme fluorescent lamp ballasts — used as standard by leading fluorescent builders, are designed to the exact operating characteristics of the fluorescent lamps. Acme fluorescent ballasts have balanced secondary voltage essential to peak performance, high efficiency and long lamp life. In addition, Acme fluorescent lamp ballasts are noise-insulated against normal magnetic action. Don't gamble, — avoid ballast burnout, specify Acme fluorescent ballasts for your fluorescent installations. Remember, a troublesome, blacked-out fixture may keep a man and machine from important production. Bulletin 157 tells why you'll benefit.

#### ACME AIR COOLED

#### TRANSFORMERS

Now up to 50 KVA  
2400 volt Primary

Learn how Acme Air Cooled  
transformers can be used effectively to speed production in  
war plants. Now available in  
ratings 3 to 50 KVA, 3 phase  
60 cycle, 240/480; 600, 2400 volt  
primary. 1½ to 50 KVA single  
phase, 240/480; 600, 2400/4160  
volt primary. Write for Bulletin  
147.



**THE ACME ELECTRIC & MFG. CO.**  
36 Water Street

Cuba, N. Y.

**Acme**  **Electric**  
TRANSFORMERS

## In the News

[FROM PAGE 105]

Killark Electric Manufacturing Company, of St. Louis, Mo., has appointed the Crescent Sales Company, 298 Duquesne Way, Pittsburgh, its representative in Western Pennsylvania and West Virginia.

Allis-Chalmers Mfg. Co. has appointed S. H. Mortensen chief electrical engineer of the plants at West Allis, Cincinnati, Boston and Pittsburgh.

The P. D. George Company of St. Louis, Mo., announces the appointment of the Insulation Manufacturers Corporation as official distributors of Pedigree insulation varnishes and compounds. Offices and representatives are maintained in Chicago, Cleveland, Milwaukee, Minneapolis and Peoria.

Eagle Electric Mfg. Co. has moved into their new home at 23-10 Bridge Plaza South, Long Island City, N. Y.

The Boston Woven Hose & Rubber Company announces the appointment of Gordon N. Lewis as sales manager of its Tape Department. Mr. Lewis was formerly associated with Jenkins Bros. Co., Bridgeport, Conn.

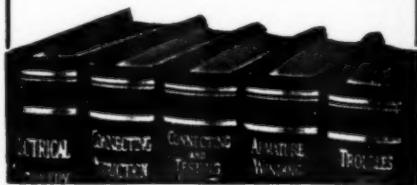
### Blackstone's Protege

Harry L. Thomas, Chief Electrical Inspector, City of Memphis, Tenn., has worked up a new bit of parlor magic which he, under considerable persuasion, will demonstrate. Harry, however, confines his tricks strictly to social gatherings. He is wondering how to pull a few substitutes out of the hat to help along the material shortage situation.

### Dameron and Hahn in Wahoo

Wahoo, Nebraska, is the new address of G. V. (Denny) Dameron and Herman Hahn of Kansas City, Mo. They are working for the Evans-Federal Electrical Contractors, Inc., the Harry Evans—Tom Bash combination formed to handle the Nebraska Ordnance Plant electrical work.

## EVERY PHASE of electrical maintenance and repair work covered in this library



5 volumes of practical  
how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

## Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations  
and diagrams

*These books show you how to*

- install all types of motor and generator units;
- locate breaks in armature windings and do a workmanlike job of rewinding;
- know just what is wrong with an electrical machine and take charge of installation and maintenance work;
- make accurate tests of switchboards and apparatus and correctly balance the power with the load;
- handle every sort of wiring job;
- show competence whether it be in the use of a Stillson wrench or a Wheatstone bridge.

### Includes trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stamford's *Troubles of Electrical Equipment*, a book giving much of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination  
Easy monthly payments

We want you to examine this Library for 10-days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

### EXAMINATION COUPON

McGraw-Hill Book Co., Inc.  
330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you \$1.00 in 10 days, and \$2.00 a month until \$15.00 has been paid. Otherwise I will return the books postpaid.

Signature .....

Address .....

City and State .....

Firm or Employer .....

Position .....

EC. 8-2



**CORNERED**—F. D. Perry, Lansing, Michigan, corners Clifford McCartney of Detroit for an after-session gab-fest on contractor problems at the recent Wolverine State Electrical Contractors convention.

#### Sewell With Ricketts

L. G. Sewell has joined the S. F. Ricketts Electric, Ltd., Vancouver, B.C., electrical contracting and engineering organization.

The firm will now be known as the Ricketts-Sewell Electric, Ltd., and will continue operations at the present offices at 429 Pender St., Vancouver, B.C.

#### K. C. Wiring Record Soars

Certified Red Seal Adequately Wired homes continue on the upswing in Kansas City, Mo. April brought 105 certified homes, piling up a 462 score to date, for this year. This compares with 163 for the same period last year, a 184 per cent increase and a new 16-year record so far.

#### Meet the Skipper

Skipper Emmett Terrell—that's the title friends of C. E. Terrell, prominent Chattanooga electrical contractor, will bestow on him, especially after they have been piloted around Chickamauga in his new 30-foot cabin cruiser, complete with kitchen, bath and bunks. At the Tennessee contractors' meeting Emmett was more than generous with his boat rides. And Harry Lanahan, Memphis contractor, who apparently got his nautical training on the Mississippi, proved an excellent co-pilot. These southern boys really know how to enjoy life at its best.

#### Jones on IAEI Executive Council

C. M. Jones, field engineer for Underwriters' Laboratories, Inc., Atlanta, Ga., and secretary-treasurer, Southern Section, IAEI, was recently appointed a member of the IAEI Executive Council. President W. A. Stall of the Southern Section made the appointment after a readjustment in the membership of the Council entitled the Southern section to an additional member.

## Sherman Announces New

# PLASTIC FIXTURE CONNECTORS

## 2 Colors

**RED**—for the Hot Wire

**WHITE**—for the Ground



**S**

The most improved Fixture Connector on the market. Made of tough, durable PLASTIC and color coded so you can identify connections after they are made—a great convenience where wiring is not polarized.

Ample size body and set screw. Completely non-metallic—the only non-metallic connector with positive set screw for permanently securing wires. No return trips to repair black-outs.

Packed—100 in carton, all one color. Also furnished in bulk as specified.

- Extra strong, with larger body and set-screw
- Completely non-metallic — no taping
- Installed with ordinary screw driver
- Color coded, for easy identification of connections
- Made entirely of tough, durable Plastic

**H. B. SHERMAN MFG. CO. Battle Creek, Mich.**

## UpTeGraff Transformers



Send for Bulletins



**SUBWAY**  
Type DS built to insure water tightness. Tell us your Transformer needs.



**POWER**  
Designed to meet particular needs: fulfills the highest requirements of all modern standards.



**DRY TYPE**  
To change secondary power voltages to other voltages, and where oil for cooling is not allowed.

**R.E. UPTEGRAFF Manufacturing Co.**  
SCOTTDALE • PENN'A • U.S.A.

# LIGHTNING PROTECTION



**ARSENALS  
MAGAZINES  
LOADING PLANTS  
AMMUNITION DUMPS  
AVIATION BUILDINGS**  
*and other government properties*



**You can supply all needs from this complete line**

## Get I. P. C. Facts

### POINTS AND CABLES

Every piece of this equipment is designed to meet rigid specifications. I.P.C. equipment is easily applied and once in place gives permanent protection.

### CONNECTORS AND FASTENERS

Designed for permanence and ease of installation. Fittings are made of copper bronze and furnished tinned if required. Every type for every possible application.

### GROUND CONNECTORS

Complete line of solderless clamps, copperweld ground rods and cable.

### WRITE FOR BULLETIN

We have a specially prepared bulletin that gives complete data. Be sure to send for your copy at once.

## INDEPENDENT PROTECTION CO., INC. GOSHEN, INDIANA

### SERVICE OFFICES:

420 Lexington Avenue, New York City  
Murray Hill 9-8897  
11 North Pearl Street, Albany, New York  
4000 Zenith Avenue So., Minneapolis,  
Minn.  
5229 Nottingham Avenue, St. Louis, Mo.

## —More Gossip—

### Boston Group Buys Bonds

Boston electrical contractors are not content with the part they are playing as construction organizations on the home front. They want to do an additional bit toward our war effort. So the Electrical Contractors Association of Greater Boston, Inc., unanimously voted to increase the dues. With the proceeds the Association will buy U. S. War Bonds.

### Ritt Heads Trade Managers

William A. Ritt, secretary-manager of the North Central Electrical Industries and the Minnesota Electrical Council, Minneapolis, was recently elected president of the Minnesota Trade Managers Council, an organization representing 44 of the leading trade groups in the state.

### Appointed to C.E.C. Committee

Two new responsibilities have been added to the capable shoulders of S. A. B. Kembry, chief electrical inspector, Province of Alberta, Canada, and a member of the Northwestern Section, IAEI. He has been appointed as provincial representative on the Approvals Council and also on the Committee on the Canadian Electrical Code.

### Cambridge Mass. Inspector Retires

Wire Chief Timothy C. O'Hearn of Cambridge, Massachusetts, retired on June 30 after more than 39 years of service in Cambridge. David J. O'Connor, senior member in the Cambridge Wire Department, has been appointed acting city electrician.



**W. A. PARINGER**, Elmhurst Electric Co., Elmhurst, Ill., tells a story that is thoroughly enjoyed by Charles Schick (left), B & L Electric Co., of Brookfield, Ill.

## SEARCHLIGHT SECTION

(For Rates see July Issue)

## ELECTRICAL DESIGNERS AND DRAFTSMEN

for power applications and distribution system design on steel plants, oil refineries and power plants.

This is

### IMPORTANT WAR WORK

working a continuous cycle of one week of 44 hours followed by two weeks of 56 hours each. Time and one-half paid for work in excess of 40 hours per week.

In replying please give complete details including compensation desired.

**ARTHUR G. MCKEE & COMPANY**  
2300 Chester Avenue  
Cleveland, Ohio

Applicants now employed on war work will not be considered, unless they obtain written release from present employer.



## For Sale at a Bargain 550 USED ceiling electric light FIXTURES

Good Condition Immediate Delivery  
100 Graybar A-6H43320 16" Globe Solid Brass Stems  
200 Guth Super-Illuminator R4357.300—  
500W, 18" Diam., 36" long, aluminum  
250 Silveray Industrial reflectors — #12  
27½ Diameter.

Will sacrifice to buyer of entire lot  
FS-34, Electrical Contracting  
630 West 42nd St., New York City

**TRANSFORMERS**  
REBUILT—REPAIRED  
Industrial Distribution Transformers  
OIL OR AIR COOLED  
Write  
**JOHNSON ELEC. MAINTENANCE CO.**  
1615 Clybourn Ave. Chicago, Ill.



**LEAGUE OFFICERS** of the West Suburban Electric League which includes communities surrounding Chicago, are (L. to R.) vice-president, Otto G. Kracht, Harold Electric Co., Oak Park, Ill.; and president, Joseph Turek Jr., Avers Electric Co., Berwyn, Ill.

#### Harmon on Electrical Council

Appointment to membership in the Underwriters' Laboratories Electrical Council was recently accepted by C. M. Harmon, superintendent, Electrical Department, Middle Division, Middle Department Rating Association, Philadelphia, Pa. Mr. Harmon succeeds Carlyle H. Hill.

#### IAEI Sets Up Reference Files

As an additional service to its members, the International Association of Electrical Inspectors headquarters are preparing a "Library File" on numerous subjects of interest to members. The files consist of binders in which are inserted copies of reports, addresses, newspaper clippings, magazine articles, and other information bearing on a particular subject.

The Files will provide a source of information for members interested in a particular subject for preparation of an address, paper or a study of the particular subject. The Files are mailed to members on request and must be returned to headquarters after they have served their purpose.

Although comparatively new, the Files, to date, contain information on the following subjects: Adequate Wiring; Civil Service; Court Decisions; Electrical Fence; Electrolysis; Examination Questions; Farm Wiring; Hospitals; Inspectors' Salaries; Lightning Arrestors-Interconnected Neutral; The National Electrical Code-A Description of Its Purpose and the Manner in Which It Is Formulated; Newspaper Releases; Radio Talks; Reinspection; Schools; State Legislation; Static Electricity; Suggestions for the Preparation and Conduct of Section and Chapter Meetings; Vocational Education; and Wiring Methods.

Here is a service that will save members much time and energy when pursuing a study of any of the listed subjects. To help build up the files, members who may have information of interest in the subjects listed are requested to forward it to the association headquarters.

## WHERE TO BUY

### Equipment, Materials and Supplies for Electrical Construction—Maintenance—Repairs

#### DRILLS CONCRETE—METAL—WOOD



#### WODACK "DO-ALL"

#### ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to  $1\frac{1}{2}$ " dia.; metal to  $\frac{3}{8}$ ". Two tools in one. Easy to maintain. Universal motor. Write for folder.

**Wodack Electric Tool Corporation**  
4628 W. Huron St. Chicago, Ill.  
Telephone AUSTIN 9866

#### ALLEN Flux for STAINLESS STEEL

For production, maintenance, and repair work. Works with all solders—fast—easy. Send for free samples.

**L. B. ALLEN CO., INC.**  
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## TEST-O-LITE

Tests Everything Electrical  
From 100 to 550 Volts

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires; tells A.C. from D.C.



Only TEST-O-LITE, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also.

List \$1.50  
at leading jobbers.  
**L. S. BRACH**  
MANUFACTURING CORPORATION  
57 Dickerson St., Newark, N. J.



**The TORK-CLOCK CO., Inc.**  
MOUNT VERNON, NEW YORK

#### An Achievement in SILENCE!

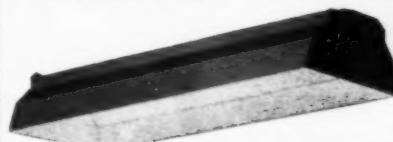
"Positively noiseless," verdict of users. Abolish irritating indoor A.C. contactor hum, with mechanically held

#### ZENITH REMOTE CONTROL SWITCH

Instantaneous opening and closing. Ample capacity for heavy loads. Use with time switch and any number MC push switches for remote control. 2 to 4 pole, 30 to 400 amps. Send for complete Zenith Catalog.

**ZENITH ELECTRIC CO.**  
845 S. Wabash Ave., Chicago, Ill.

## WILEY Industrial FLUORESCENT FIXTURES



are made in all types for every industrial lighting application, close to ceiling installation or suspended on hangers; continuous or separate units; open reflector or louvered types. Each unit is complete, no connecting boxes are required. WILEY Fluorescent Fixtures are the product of an experienced, proven manufacturer.

Write for Booklet EC-82  
**R. & W. WILEY, INC.**  
777 Hertel Ave. Buffalo, N. Y.  
Member Fleur-O-Lier Manufacturers Association

**"No Priority" SILOY SODER**  
To replace most grades. No increase in price—send for details.  
**L. B. ALLEN CO., INC.**  
6715 Bryn Mawr Ave., Chicago, Ill.

#### TATTELITE Tells on 'em!

Tests Door Bells. Checks Operation of Relay Contacts. Picks out burnt out fuses. Pocket size, 3 to 25-volt range. Tests air-conditioning and heat controls. Checks telephone, auto, airplane and wiring circuits. Finds blown fuses, etc., etc., etc. Full "use" directions with each Tattelite. Price each \$1.75. 90 to 500 volt Pocket Type tester, only \$1.00. Ask for free catalog.



**LITTELFUSE INC.** 4789 Ravenswood Ave., Chicago, Illinois

# CAPACITORS



Just count on Aerovox for those motor-starting capacitor replacements. Here's why:

Aerovox has the most complete, latest, dependable replacement listings. It's easy to pick out just the right type for that refrigerator motor. Furthermore, Aerovox offers both Universal and Exact Duplicate Replacements in most instances, for your selection.

## Ask Your Jobber . . .

Ask him for a copy of the Aerovox Abridged Motor-Starting Capacitor Catalog. He carries a stock of Aerovox motor capacitors for your convenience. Or write us direct.



NEW BEDFORD, MASS., U. S. A.  
In Canada: AEROVox CANADA LTD., Hamilton, Ont.  
EXPORT: 100 Varick St., N. Y. Cable: ARLAB

## The Stone You Can Bend and Twist



DRESSES  
AND CLEANS  
ALL ELECTRICAL  
PARTS AND  
CONTACTS

## Flex-Stone

What a job FLEXSTONE does! Cuts like an abrasive stone—but you can bend, twist it. Won't break! Thin, non-brittle. Sharpest abrasives are pressed into flexible core. Easily fits tight places. Smooths hardest contact points in relays, cutouts — cleans small commutators, switches, etc. Non-conductor — no short circuit. Rimac FLEXSTONE speeds electrical service. Send for free sample!

RINCK-McILWAINE, Inc., 16 Hudson St., New York, N. Y.

*Test Insulation the Modern Way  
with a MODEL B-5*

**MEG OH M ER**

No more tiresome cranking of a hand-driven generator.

This entirely self-contained instrument operates with a steady test potential of 500 volts DC, available at the touch of a switch. Direct readings in insulation resistance.

**HERMAN H. STICHT CO., INC.**  
27 Park Place • New York, N. Y.

PLEASE MAIL BULLETIN 430 for full details.

Name.....

Firm.....

Address.....



## More Gossip

### Hawaiian Service Shop Survives

J. G. Glass of the Hawaiian Electric Co., Ltd., Honolulu, recently wrote NISA headquarters that his shop and personnel escaped 100 percent last December, and that they are busier than the proverbial bee. Differing from most motor shops, this organization has to service all domestic appliances ranging from hair dryers to air conditioners, ranges and refrigerators.

Plans for their new shop are being held up for the duration. The site has been chosen and plans and specifications are all drawn, including an air conditioned office, palm trees lining the street and all the trimmings—but all must wait now.

### N.C.E.I. War Bulletin

As a wartime service to its members, the North Central Electrical Industries, Minneapolis, is publishing a "War Regulations Bulletin" on a separate and distinctive format.

Each bulletin contains an individual file reference together with the latest information on War Regulations affecting the electrical industry. Distribution of each bulletin is made only to those who are directly affected, but subscribers can, upon request, receive other bulletins. Recent action by the N.C.E.I. Directors makes these Bulletins available to unaffiliated industry units on a subscription basis.

### New Quarters

The William Van Domelen Co. now occupies its new quarters at 218 Ogden Ave., Menominee, Mich. The firm, which services electrical equipment for many firms in the Upper Peninsula of Michigan and northeastern Wisconsin, plans to increase its wartime activities.



ROUND THE CLOCK training of electricians is explained by Harold F. Fye, (left) chairman, Electrical Department, Technical High School, Indianapolis, to Walter Zervas, managing director, Electrical League of Indianapolis. Due to the heavy defense training schedule, the shop is vacant only two hours per day.



SLEEVES ROLLED UP and rarin' to go, is characteristic of J. C. Bogardus, shop superintendent, Fife-Pearce Electric Co., Detroit, Michigan. J. C. keeps the motor repair department humming and keeps the decks cleared for action when motors go down.

#### U. L. Mobile Units Garaged

In line with the gasoline and rubber conservation efforts, Underwriters' Laboratories, Inc., have called in all the Mobile Units which have been operating throughout the country. They will be placed in storage for the duration of the war. The operating personnel of these units are now located at various branch offices of the Laboratories.

#### Strong Gets State Job

Elias J. Strong, manager, Electrical League of Utah, Salt Lake City, and secretary of the Utah Chapter, IAEI, is now numbered among the employees of the State of Utah. He was recently appointed as Secretary to Governor Maw of Utah.

#### Fort Wayne Modifies Code

An ordinance recently passed by the city council and signed by the mayor of Fort Wayne, Ind., provides, in a legal manner, approval of material substitutions, where warranted, by the inspector in his respective department; effective until six months after the duration of the present war, or at such earlier date as the council may direct.

Among the modifications of the Fort Wayne electrical code are the following:

1. Where cable is permitted for range circuits, No. 8 wire will be accepted for the No. 6 required at present.
2. Type C, horsepower rated, power switches may be used in place of Type A switches and need not have the dead-front shield.
3. Lighting switches of 100 amperes and over need not be dead-front.
4. For services, No. 6 will be accepted in place of the present requirement for No. 4 wire.
5. The 1937 Code carrying capacities are acceptable for rubber-covered wires.
6. Type S fuses are required only by special order.

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★ These companies have included Briefalogs, containing additional buying information on their products, in the 1942 edition of the Electrical Buyers' Reference.





**PICTURESQUE** Bigwin Inn on Lake of Bays, Ontario, where NECA's annual convention will be held.

**R**EGULATIONS and restrictions essential to war economy and the business responsibilities of the electrical contractor for full cooperation with the war effort will highlight the 41st annual meeting of the National Electrical Contractors Association. The conference will be held at Bigwin Inn, Lake of Bays, Ontario, opening August 31 and adjourning September 3.

In spite of pressing business demands in these days on NECA members, the urgency of the problems before the industry and the complexity of wartime business rules are expected to bring a record attendance. Speakers from government war agencies and the chairmen of NECA committees will discuss subjects including priorities, industry war standards and labor problems. Preliminary program is outlined on this page.

In addition to the business sessions the convention schedule has been prepared to permit ample time for delegates to take advantage of the excellent recreation facilities of Canada's famous Lake of Bays country.

For those planning to attend, the following train schedule has been announced by NECA headquarters.

Saturday—Aug. 29

Leave Toronto via Canadian National Railway—11:05 a.m.

Arrive Bigwin Inn (through boat connection)—6:35 p.m.

The return trip is scheduled for Friday, Sept. 4 or Saturday, Sept. 5.

Leave Bigwin Inn—8:00 a.m.

Arrive Toronto—3:45 p.m.

The same schedules are available daily except Sunday.

It is important that every man under 65 obtain from his Local Draft Board and carry with him a "Permit of Local Board for registrant to depart from the United States." All should carry identification and proof of citizenship.

## NECA to BIGWIN

National Electrical Contractors Association to hold War Conference at Canadian Lake Resort, August 31 through September 3.

### CONVENTION SPEAKERS AND SUBJECTS

#### GENERAL:

Robt. W. McChesney, President, NECA, Washington, D. C.  
President's Opening Address

Geo. W. Patterson, NECA Executive Committeeman for Canada, Toronto, Ont.  
Address of Welcome

Eric A. Johnston, President, Chamber of Commerce of U. S., Washington, D. C.  
"Team Play for Victory"

Arthur L. Brown, Director of Electrical Equipment and Supplies of the Wartime Prices and Trade Board, Ottawa, Ontario  
"Streamlining Industry and Commerce"

Morris J. McHenry, Sales Promotion Manager, Hydro-Electric Power Commission of Ontario, Toronto, Ont.  
"The Canadian Electrical War Effort"

Dean Harvey, Chief, Electrical and Mechanical Section, Specifications Branch, Conservation Division, War Production Board, Washington, D. C.  
"Conserving Our Vital Resources"

Representative of Army Specialist Corps, War Department, Washington, D. C.  
"Opportunities for War Service"

Col. O. R. McGuire, General Counsel, NECA, Washington, D. C.  
"Post War Business Prospects"

#### ADMINISTRATIVE REPORTS:

Laurence W. Davis, General Manager, NECA, New York, N. Y.  
Annual Report on the Association

E. H. Herzberg, Executive Assistant to the President, NECA, Washington, D. C.  
"NECA's Washington Office and Its Services"

#### FIELD ACTIVITIES:

Paul M. Geary, Field Supervisor, NECA, Washington, D. C.  
"Streamlining Our Organization"  
Wm. J. Varley, Western Representative, NECA, San Francisco, Cal.  
"Progress in the Western States"

#### CODES AND STANDARDS:

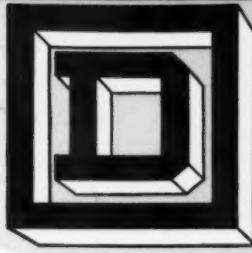
George Andrae, Chairman, NECA Codes & Standards Committee, Milwaukee, Wisconsin  
"Industry Standards in the Emergency"  
Speaker from Underwriters' Laboratories, Inc.  
"Emergency Substitute Materials"

#### LABOR RELATIONS:

E. C. Carlson, Chairman, NECA Labor Relations Committee, Youngstown, Ohio  
"Construction Without Labor"  
E. J. Brown, President, International Brotherhood of Electrical Workers, Washington, D. C.  
"What Then?"  
Joseph D. Keenan, Associate Director, Labor Production Division, WPB, Washington D. C.  
"Stabilization of Employment on Defense and War Construction"

#### APPRENTICE TRAINING:

E. H. Herzberg, Chairman, National Joint Committee on Apprenticeship Standards, Washington, D. C.  
"Progress of Local Apprenticeship Committees"  
W. F. Patterson, Executive Secretary, Federal Committee on Apprenticeship, U. S. Department of Labor, Washington, D. C.  
"War Training Sparked by Electrical Apprenticeship"



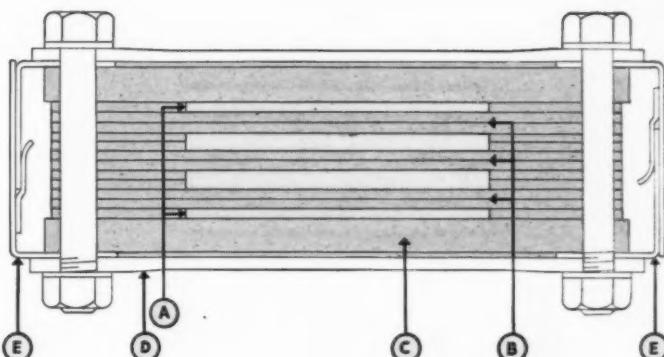
# SAFLEX (LOW REACTANCE) FEEDER DUCT

- ✓ Only 1.8 Volts drop per 100 feet
- ✓ Phases balanced at all points
- ✓ Only 38° C. temperature rise

Square D Safflex (Low Reactance) Feeder Duct is designed to serve as the feeder between transformer banks and main switchboard or as feeders to branch circuits where minimum voltage loss is essential. Because of its low reactance and consequent low voltage drop, it is ideally suited for welder circuits and, as a result, conductor size may be kept at a minimum.

The special non-critical insulation of Safflex Feeder Duct also constitutes approximately 80% of its housing, thus eliminating large use of vital war materials such as steel. Safflex Duct is available in standard 10-foot sections with special fittings to meet all types of building structures.

Let a Square D Field Engineer give you the complete story.



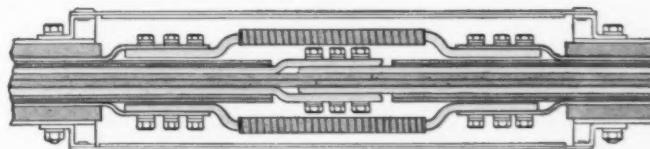
**A Split Bus.** Assures uniform and low voltage drop because it provides close spacing and electrical symmetry of phases.

**B 1/4" Insulated Space** between opposite busses also helps to keep voltage losses at a minimum.

**C Special Insulation** totally encloses busses. Has high mechanical and dielectric strength, is impervious to moisture and resistant to an arc. Conducts heat readily and thus insures low temperature rise.

**D Surge Clamps** every 24 inches give structural and mechanical strength to withstand 50,000 amperes short circuit with a substantial factor of safety.

**E Steel Channels** at top and bottom complete the housing which totally encloses the busbars.



#### Connection between Bus Sections (top view)

Note that all bolts for joints face outward and are accessible through hand hole openings which provide ample working space. Steel cover plates over hand holes are easily and quickly removed.

CALL IN A SQUARE D MAN

**SQUARE D COMPANY**

DETROIT - MILWAUKEE - LOS ANGELES  
KOLLMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK  
IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

*All over the country*

# G-E WIRING MATERIALS DISTRIBUTORS

## OFFER WIRING SUPPLIES FOR WAR PROJECTS

Whether you are handling the wiring of a new project, changing the wiring of an existing plant or taking care of vitally important wiring systems — see the G-E Wiring Materials Distributor near you for necessary wiring materials. G-E Wiring Materials Distributors are located at key points all over the country.

Talk with a representative of your G-E Wiring Materials Distributor about your war jobs. Ask him for advice on priority problems . . . for help in selecting materials . . . for wiring suggestions . . . for information on materials for special wiring. He will be glad to help you.

Remember too, that G-E Wiring Materials Distributors handle a complete line of conduits, boxes and fittings, wires and cables and wiring devices — all of high quality. Your customers will be pleased with the dependable service these materials give.

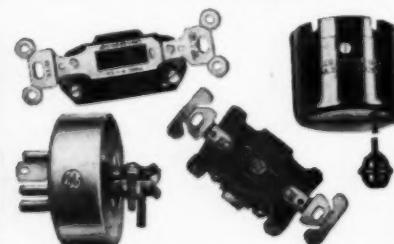
## GENERAL ELECTRIC



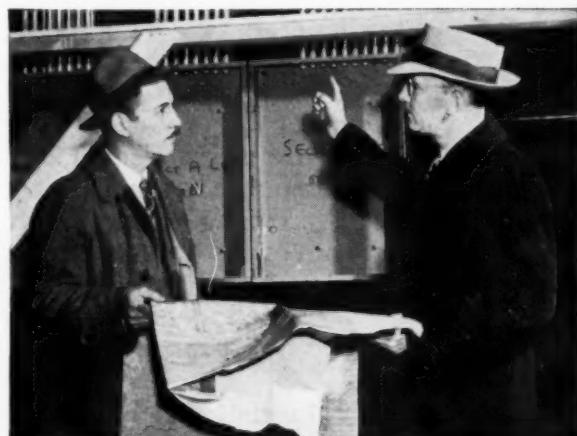
The G-E wiring materials field force is divided into geographical districts in order to provide greater help for distributors and their customers. Here is O. W. Cerny, manager of District No. 4. His headquarters are in Cleveland, Ohio

### G-E WIRING MATERIALS INFORMATION

See your G-E Wiring Materials Distributor for full information on G-E conduit, wire and cable and wiring devices to meet your special needs. Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.



C. P. Bowman, city and inside electrical salesman, Hendrie & Bolthoff, Mfg. and Sup. Co., Albuquerque, N. M., G-E distributor is here checking on materials for special wiring required for war project before calling on contractor handling job.



A. B. Lakin (right), purchasing agent, Harry Alexander, Inc. and A. L. Coleman, salesman, General Electric Supply Corporation, Washington, D.C. are discussing materials required for new office building. Conduit and other materials were supplied.



W. E. Aiken (right), salesman, General Electric Supply Corporation, Scranton, Pa., and Elmer Luft, electrical contractor, Wilkes-Barre, Pa., are here discussing wiring materials suitable for job Mr. Luft is handling.



